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TAXONOMY OF THE GENUS *ARACHIS* (LEGUMINOSAE)

by

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Almost 100 years elapsed between Linnaeus' naming the then lone species of *Arachis* (*A. hypogaea* L.) known to Europeans, and the first taxonomic treatment of the genus by Bentham in 1841. During the next 100 years five to ten additional species descriptions appeared, assigning different species to the same names, and different names to the same species. By mid-20th Century, it was impossible to examine any herbarium collection of *Arachis* and assign any epithet with any assurance to any specimen (which was not a type collection) except to *A. hypogaea*, *A. guaranitica*, *A. tuberosa* and *A. villosulicarpa*.

In our treatment, the literature of this botanical chaos in *Arachis* is reviewed in detail and an assessment is made of the foundations for its occurrence. It is shown that the bases for the confusion lay in the combination of the esoteric nature of the differentiating morphological features of *Arachis*, the fragmentary early collections, and the representation of species by seedling specimens.

Also, it is related how, in 1959, we decided to re-explore the type locality of each species then known, collect therein complete plant specimens and thereby resolve the problem. Thirty-five years, two generations of plant collectors and around 2000 collections later, we present here 69 species descriptions of *Arachis*, species distributed in South America east of the Andes, south of the Amazon, north of La Plata and from NW Argentina to NE Brazil.

We soon discovered that the most significant characters of *Arachis* lay in their underground structures, including their fruits, rhizomatous stems, root systems and hypocotyls.

We showed that these defining characters tended to cluster the collections into groups which were associated with generally different geographic areas and ecological features.

We drew a sample of 100 collections representing these clusters, areas and features, and arranged them in a hybridization diallel and showed, in crosses between collections representing different clusters of characters, areas and features, a remarkable number of complete failures to cross-fertilize and, in those hybrids that were recovered, a high degree of F_1 hybrid infertility. When these cross-incompatibilities and pollen infertilities were combined with the data on character clustering, the nine distinct sections of the genus presented here then crystallized. Figures imposed upon maps of South America illustrate the geographic distributions of these sections.

The collections were then assigned to the different sections on the bases of cross-incompatibility and exo-morphologic character clustering. When these groups were made, the esoteric characteristics referred to above, so confounding when applied across sectional lines, became highly pertinent when applied to the problem of species differentiation between collections within sections. These characteristics, applied in conjunction with chromosome cytology, chromatographic and antigenic reactions, variations in intra-sectional hybrid fertility and adaptations of plant form, and annual and perennial habit, allowed us to assemble the following taxa of the genus *Arachis*: Section I. *TRIERECTOIDES nov.*: 1. *A. guaranitica*, 2. *A. tuberosa*. Section II. *ERECTOIDES nov.*: 3. *A. Martii*, 4. *A. brevipetiolata nov.*, 5. *A. Oteroi nov.*, 6. *A. Hatschbachii nov.*, 7. *A. cryptopotamica nov.*, 8. *A. major nov.*, 9. *A. Benthamii*, 10. *A. douradiana nov.*, 11. *A. gracilis nov.*, 12. *A. Hermannii nov.*, 13. *A. Archeri nov.*, 14. *A. stenophylla nov.*, 15a.

A. paraguariensis subsp. *paraguariensis*, 15b. *A. paraguariensis* subsp. *capibarensis nov.* Section III. *EXTRANERVOSAE nov.*: 16. *A. setinervosa nov.*, 17. *A. Macedoi nov.*, 18. *A. marginata*, 19. *A. prostrata*, 20. *A. lutescens*, 21. *A retusa nov.*, 22. *A. Burchellii nov.*, 23. *A. Pietrarellii nov.*, 24. *A. villosulicarpa*. Section IV. *TRISEMINATAE nov.*: 25. *A. triseminata nov.* Section V. *HETERANTHAE nov.*: 26. *A. Giacomettii nov.*, 27. *A. sylvestris*, 28. *A. pusilla*, 29. *A. Dardani nov.* Section VI. *CAULORRHIZAE nov.*: 30. *A. repens*, 31. *A. Pintoi nov.* Section VII. *PROCUMBENTES nov.*: 32. *A. lignosa nov. comb.*, 33. *A. Kretschmeri nov.*, 34. *A. Rigonii*, 35. *A. chiquitana nov.*, 36. *A. matiensis nov.*, 37. *A. appressipila nov.*, 38. *A. Vallsii nov.*, 39. *A. subcoriacea nov.* Section VIII. *RHIZOMATOSAE nov.*, Series *PRORHIZOMATOSAE nov.*: 40. *A. Burkartii.* Series *RHIZOMATOSAE nov.*: 41. *A. pseudovillosa nov. comb.*, 42a. *A. glabrata* var. *glabrata*, 42b. *A. glabrata* var. *Hagenbeckii.* Section IX. *ARACHIS*: 43. *A. glandulifera*, 44. *A. cruziana nov.*, 45. *A. monticola*, 46. *A. magna nov.*, 47. *A. ipaënsis nov.*, 48. *A. valida nov.*, 49. *A. Williamsii nov.*, 50. *A. Batizocoi*, 51. *A. duranensis nov.*, 52. *A. Hoehnei nov.*, 53. *A. stenosperma nov.*, 54. *A. praecox nov.*, 55. *A. palustris nov.*, 56. *A. benensis nov.*, 57. *A. trinitensis nov.*, 58. *A. decora nov.*, 59. *A. Herzogii nov.*, 60. *A. microsperma nov.*, 61. *A. villosa*, 62. *A. helodes*, 63. *A. correntina nov. comb.*, 64. *A. Simpsonii nov.*, 65. *A. Cardenasii nov.*, 66. *A. Kempff-Mercadoi nov.*, 67. *A. Diogoi*, 68. *A. Kuhlmanii nov.*, 69a. *A. hypogaea* subsp. *hypogaea* var. 1. *hypogaea*, var. 2. *hirsuta*, 69b. *A. hypogaea* subsp. *fastigiata* var. 1. *fastigiata*, var. 2. *peruviana nov.*, var. 3. *aequatoriana nov.*, var. 4. *vulgaris.*

The autogamous reproductive systems, agametic reproduction, underground fruiting habit and the limited means of seed dispersal are shown to be logically tied to the drift in chromosomal organization which gives rise to noticeable increases in infertility in crosses between different collections of the same species, to a variably higher infertility in crosses between species within sections, to a near total infertility in crosses between species from different sections.

The evolutionary and phylogenetic relationships between the different sections are discussed and are further shown in a sequence of diagrams illustrating the ideas presented. It is evident that the genetic distances separating the sections are far from being of the same magnitude. The presumably older sections (*Triseminatae, Trierectoides, Erectoides, Extranervosae* and *Heteranthae*), except for section *Erectoides*, are much more isolated from the remaining sections and from each other than those taken to be of more recent origin (*Procumbentes, Caulorrhizae, Rhizomatosae* and *Arachis*).

Section *Arachis* is by far the largest, containing about 40% of the species described. Species of this section appear to be spreading into new territory and to be invading areas occupied by species of other sections. They grow intermixed with populations of *Extranervosae* in the upper Paraguay basin and occupy common ground with section *Procumbentes* in the Gran Pantanal. They have reached the shores of La Plata and the southeastern coast of Brazil and grow from Yala in NW Argentina to the Tocantins in NE Brazil. They include the worldwide cultivar, *A. hypogaea.*

Essentially every published work on the botanical history and taxonomy of *Arachis* is presented here in the individual specimen references and in the general bibliography. The history of *A. hypogaea* from the early 16th Century to more recent times, along with the common names in several native American languages, provide a perspective on the antiquity of this cultivar and the level of civilization required for its creation.

Six appendices provide supporting data and matters of record. Diagnostic keys to the sections and to the species within each section select the more sharply distinguishing characteristics of the sections and species. Nineteen line drawings capture the sectional and species structures of whole plants, root systems, fruit orientations, agametic reproductions from fruiting structures, carpel shapes and surface features of leaves and stems.

Key words: *Arachis*, peanut, groundnut, Leguminosae, history, taxonomy, genetic resources, phytogeography

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Pasaron casi 100 años entre la designación por Linneo de la entonces única especie de

Arachis (*A. hypogaea* L.) conocida por los europeos, y el primer tratamiento taxonómico del género por Bentham en 1841. Durante los siguientes 100 años, aparecieron cinco a diez descripciones de especies adicionales, que asignaban diferentes especies a los mismos nombres, y diferentes nombres a las mismas especies. A mediados del Siglo XX, era imposible examinar un ejemplar de herbario de *Arachis* y asignar con alguna certeza algún epíteto a algún espécimen (que no fuera un ejemplar tipo) excepto a *A. hypogaea, A. guaranitica, A. tuberosa* y *A. villosulicarpa*.

En nuestro tratamiento, la literatura de este caos botánico en *Arachis* esta revisada en detalle y se hace un análisis de los fundamentos de su ocurrencia. Se demuestra que las bases de la confusión moran en la combinación de la naturaleza esotérica de los caracteres morfológicos diferenciados de *Arachis*, de los especímenes fragmentarios de antaño, y de la representación de especies por plántulas.

Además, se relata cómo, en 1959, decidimos reexplorar la localidad tipo de cada especie hasta entonces conocida, y recolectar allí especímenes de las plantas enteras y así resolver el problema. Después de treinta y cinco años, dos generaciones de coleccionistas de plantas, y alrededor de 2000 colecciones, presentamos aquí las descripciones de 69 especies de *Arachis*, especies distribuidas en Sudamérica al este de los Andes, al sud del Amazonas, al norte de La Plata y desde el noroeste argentino hasta el nordeste de Brasil.

Descubrimos muy pronto que los caracteres más significativos de *Arachis* residen en sus estructuras subterráneas, incluyendo sus frutos, tallos rizomatosos, sistemas radicales e hipocótilos.

Demostramos que estos caracteres determinantes tienden a aglomerar las colecciones en grupos que se asocian con áreas geográficas y formaciones ecológicas generalmente diferentes. Hicimos un muestreo de 100 materiales representativos de aquellos grupos, áreas, y formaciones y los arreglamos en un experimento dialélico de cruzamientos y mostramos, en cruzamientos entre materiales de los diferentes grupos, un número notable de fracasos completos en la fertilización cruzada y, en aquellos híbridos que se lograron, se observó una alta tasa de infertilidad en la F_1. Cuando se combinaron estas incompatibilidades e infertilidades de polen híbrido con los datos de agrupamiento de caracteres morfológicos, se cristalizaron entonces las nueve distintas secciones del género aquí presentadas. Las figuras impuestas sobre mapas de Sudamérica ilustran las distribuciones geográficas de estas secciones.

Las colecciones, entonces, fueron asignadas a las diferentes secciones sobre la base de las incompatibilidades de cruzamiento y de los agrupamientos de caracteres exo-morfológicos.

Al hacer estos grupos, las caracteristicas esotéricas a las cuales se hace referencia arriba, tan confusas cuando se aplican a través de los límites seccionales, se volvieron altamente pertinentes al ser aplicadas al problema de la diferenciación específica entre materiales dentro de las secciones. Estas características, aplicadas en conjunto con la citología cromosómica, las reacciones cromatográficas y antigénicas, las variaciones en la fertilidad híbrida intra-seccional y las adaptaciones de forma de planta, y de hábito anual o perenne, nos permitió definir los siguientes taxa del género *Arachis*:

Sección I. *TRIERECTOIDES nov.*: 1. *A. guaranitica*, 2. *A. tuberosa*. Sección II. *ERECTOIDES nov.*: 3. *A. Martii*, 4. *A. brevipetiolata nov.*, 5. *A. Oteroi nov.*, 6. *A. Hatschbachii nov.*, 7. *A. cryptopotamica nov.*, 8. *A. major nov.*, 9. *A. Benthamii*, 10. *A. douradiana nov.*, 11. *A. gracilis nov.*, 12. *A. Hermannii nov.*, 13. *A. Archeri nov.*, 14. *A. stenophylla nov.*, 15a. *A. paraguariensis* subsp. *paraguariensis*, 15b. *A. paraguariensis* subsp. *capibarensis nov.* Sección III. *EXTRANERVOSAE nov.*: 16. *A. setinervosa nov.*, 17. *A. Macedoi nov.*, 18. *A. marginata*, 19. *A. prostrata*, 20. *A. lutescens*, 21. *A retusa nov.*, 22. *A. Burchellii nov.*, 23. *A. Pietrarellii nov.*, 24. *A. villosulicarpa*. Sección IV. *TRISEMINATAE nov.*: 25. *A. triseminata nov.* Sección V. *HETERANTHAE nov.*: 26. *A. Giacomettii nov.*, 27. *A. sylvestris*, 28. *A. pusilla*, 29. *A. Dardani nov.* Sección VI. *CAULORRHIZAE nov.*: 30. *A. repens*, 31. *A. Pintoi nov.* Sección VII. *PROCUMBENTES nov.*: 32. *A. lignosa nov. comb.*, 33. *A. Kretschmeri nov.*, 34. *A. Rigonii*, 35. *A. chiquitana nov.*, 36. *A. matiensis nov.*, 37. *A. appressipila nov.*, 38. *A. Vallsii nov.*, 39. *A. subcoriacea nov.* Sección VIII. *RHIZOMATOSAE nov.*, Serie *PRORHIZOMATOSAE nov.*: 40. *A. Burkartii.* Serie *RHIZOMATOSAE nov.*: 41. *A. pseudovillosa nov. comb.*, 42a. *A. glabrata* var. *glabrata*, 42b. *A. glabrata* var. *Hagenbeckii*. Sección IX. *ARACHIS*: 43. *A. glandulifera*, 44. *A. cruziana nov.*, 45. *A. monticola*, 46. *A. magna nov.*, 47. *A. ipaënsis nov.*, 48. *A. valida nov.*, 49. *A. Williamsii nov.*, 50. *A. Batizocoi*, 51. *A. duranensis nov.*, 52. *A. Hoehnei nov.*, 53. *A. stenosperma nov.*, 54. *A. praecox*

nov., 55. *A. palustris nov.*, 56. *A. benensis nov.*, 57. *A. trinitensis nov.*, 58. *A. decora nov.*, 59. *A. Herzogii nov.*, 60. *A. microsperma nov.*, 61. *A. villosa*, 62. *A. helodes*, 63. *A. correntina nov. comb.*, 64. *A. Simpsonii nov.*, 65. *A. Cardenasii nov.*, 66. *A. Kempff-Mercadoi nov.*, 67. *A. Diogoi*, 68. *A. Kuhlmanii nov.*, 69a. *A. hypogaea* subsp. *hypogaea* var. 1. *hypogaea*, var. 2. *hirsuta*, 69b. *A. hypogaea* subsp. *fastigiata* var. 1. *fastigiata*, var. 2. *peruviana nov.*, var. 3. *aequatoriana nov.*, var. 4. *vulgaris*.

Se demuestra cómo los sistemas reproductivos autógamos, la reproducción agamética, el hábito de fructificación subterránea y el mecanismo limitado de dispersión de semillas están lógicamente ligados con la deriva de organización cromosómica que da origen a incrementos notables de infertilidad en cruzamientos entre diferentes accesiones de la misma especie, a una infertilidad variablemente más alta en cruzamientos entre especies dentro de las secciones, hasta una casi total infertilidad entre especies de diferentes secciones.

Las relaciones evolutivas y filogenéticas entre las diferentes secciones están discutidas y también demostradas en una secuencia de diagramas ilustrando las ideas presentadas. Es evidente que las di: tancias genéticas que separan las secciones están lejos de ser todas de la misma magnitud. Las secciones presumiblemente más antiguas (*Triseminatae, Trierectoides, Erectoides, Extranervosae* y *Heteranthae*), excepto por la sección *Erectoides*, están mucho más aisladas de las secciones restantes y entre sí que aquellas secciones que se consideran de origen más reciente (*Procumbentes, Caulorrhizae, Rhizomatosae* y *Arachis*).

La sección *Arachis* es por mucho la más grande, pues contiene cerca de 40% de las especies descritas. Parece que las especies de esta sección se están expandiendo hacia nuevos territorios e invadiendo áreas ocupadas por especies de otras secciones. Crecen entremezcladas con poblaciones de *Extranervosae* en la cuenca alta del río Paraguay y ocupan terrenos comunes con la sección *Procumbentes* en el Gran Pantanal. Han llegado hasta las orillas de La Plata y a la costa sureste de Brasil, y crecen desde Yala en el noroeste de la Argentina hasta el río Tocantins en el nordeste de Brasil. Incluyen el cultígeno de importancia mundial, *A. hypogaea*.

Esencialmente cada trabajo publicado sobre la historia botánica y la taxonomía de *Arachis* está presentado aquí en las referencias a especímenes individuales y en la bibliografía general. La historia de *A. hypogaea* desde principios del Siglo XVI hasta tiempos más recientes, junto con los nombres comunes en varios idiomas autóctonos americanos, nos dan una perspectiva sobre la antigüedad de este cultivo y el nivel de civilización requerido para su creación.

Seis apéndices proporcionan datos de apoyo e información de archivo. Claves diagnósticas a las secciones y a las especies dentro de cada sección seleccionan los rasgos más distintivos de las secciones y especies. Diecinueve dibujos de línea capturan las estructuras claves para distinguir las secciones y especies, incluyendo plantas enteras, sistemas radicales, orientaciones de frutos, reproducción agamética a partir de estructuras fructíferas, formas de carpelos, y la fisionomía superficial de hojas y tallos.

Palabras clave: *Arachis*, maní, cacahuete, Leguminosae, historia, taxonomía, recursos genéticos, fitogeografía.

Introduction

The genus *Arachis* was placed in the tribe *Hedysareae* subtribe *Stylosanthinae* by Bentham (1865) together with *Chapmannia*, *Stylosanthes* and *Zornia*. Bentham's criteria were continued by Mohlenbrock (1962) who also included *Pachecoa*, and Hutchinson (1964), who elevated the group to the category of tribe.

In 1939, Burkart separated *Zornia*, placing it in the subtribe *Poiretiinae*. This point of view was continued by Schulze-Menz (1964) and Rudd (1981), who placed the genus *Arachis* in the tribe *Aeschynomeneae* subtribe *Stylosanthinae* (Benth.) Rudd, together with the genera *Arthrocarpum* (2 spp. from Somalia and Socotra), *Pachecoa* (1 sp. from Mexico and Guatemala), *Chapmannia* (1 sp. from Florida, USA) and *Stylosanthes* (ca. 25 spp. from the Old and New World tropics and

subtropics). Of all these genera, that with greatest affinity to *Arachis* is *Stylosanthes* with which it shares fused stipules and the same basic chromosome number (x=10).

By studying the pollen morphology of the *Hedysareae*, Pire (1974) found that the genus *Zornia* shows greatest affinity with the *Stylosanthinae*, which would support the criteria of Hutchinson (1964). Two types of pollen grains are found in the genus *Arachis*, one tricolpate, in *A. hypogaea* and similar to those of *Zornia*, and the other syncolpate, similar to those of *Stylosanthes*.

The first treatment of the genus *Arachis* is owed to Bentham (1841), who described the first five wild species. Later, in 1859, he lists seven species, including *A. hypogaea*.

Chevalier (1929a), in an essay on systematic classification, tried to define the relationships among the species, which he grouped into (1) *A. prostrata* with its races *villosa, glabrata, marginata* and *pusilla*, (2) *A. tuberosa* with the related forms *A. guaranitica* and *A. paraguariensis* and (3) *A. Diogoi* with narrow leaflets. He found that *A. pusilla*, being the only annual wild species, was the most analogous with the cultivated peanut.

Shortly thereafter, Chevalier (1929b, 1929c) described the new species *A. sylvestris* and became the first author to describe and illustrate the subterranean fruit of a wild species. In this case, the fruit is constituted by only a single article.

Later, Chevalier (1933) made the first attempt at classification by producing a key. He separated perennials with slightly marked leaflet margins (*A. glabrata*), erect perennials (*A. paraguariensis, A. tuberosa* and *A. guaranitica*), perennials with subterranean stolons (*A. marginata* and *A. Hagenbeckii*), perennials with stolons growing upon the ground (*A. villosa* and *A. Diogoi*), and annuals (*A. pusilla, A. sylvestris* and *A. hypogaea*). He considered *A. sylvestris* to be the ancestor of some varieties of cultivated peanut. Although Chevalier was unfortunate in his interpretation of some species such as *A. glabrata* and *A. marginata*, his system was an important contribution because it is the first to utilize vegetative characters, both aerial and subterranean, to distinguish the species.

Burkart (1939), after studying the Argentine species, followed Chevalier's 1933 criteria and recognized five species: *A. marginata* (now *A. Burkartii*), *A. prostrata* (= *A. glabrata*), *A. villosa*, *A. pusilla* (= *A. duranensis* and *A. monticola*) and *A. hypogaea*. Burkart was correct in the delimitation of the species, but with the material at his disposal he was unable to correctly interpret the names. He was the first author to describe and illustrate a biarticulated subterranean fruit, corresponding to *A. monticola*, and shortly afterwards (Burkart 1942) added those of *A. villosa*, observed from cultivated specimens.

At about the same time, Hoehne (1940) published a revision of the genus *Arachis*. He presented a key based almost exclusively on leaflet characters. He relied upon collections made by Otero and Archer, and made use of live material of various species. The work is well illustrated and the figures demonstrate interesting vegetative characters, especially underground ones, that he did not take into account in his classification scheme. Hoehne recognized 11 species, some with numerous forms, which are described without Latin diagnoses and consequently are invalid, having been published after 1935 (Art. 36 of the International Code of Botanical Nomenclature). The interpretation of the majority of the species is confusing because Hoehne did not attach importance to the biological forms.

An important contribution was made by Mendes (1947) who, utilizing the nomenclature of Hoehne, established the diploid character of various wild species. His work is perfectly documented, enabling us to correlate his results with the following species: *A. Oteroi* (V.82), *A. Benthamii* (V.83), *A. Archeri* (V.84) and *A. major* (V.85), for which he determined 2n=20 chromosomes.

In 1949, Krapovickas and Rigoni obtained the first triploid interspecific hybrid (2n=30) after crossing *A. correntina* (2n=20) with *A. hypogaea* (2n=40).

In 1951, Krapovickas and Rigoni encountered the first wild species with the same chromosome number as the cultivated peanut (2n=40), this being *A. monticola*, which at the time they identified as *A. pusilla*.

In 1951, Gregory, Smith and Yarbrough,

following a thorough morphological analysis, laid the foundations of the present taxonomy of cultivated peanut by distinguishing the branching patterns that Bunting (1955) would later denominate "alternate" and "sequential" and Krapovickas and Rigoni (1960) would utilize to establish the nomenclature for the intraspecific taxa of *A. hypogaea.*

In 1954, Hermann published a synopsis of the genus *Arachis*, using the new collections of Stephens and Hartley (1949), in which he attempts to reconcile the criteria of Chevalier (1933), Burkart (1939) and Hoehne (1940). Hermann's treatment recognizes nine species and suffers from the same shortcomings as the previous schemes because of the unavailability of living material.

In 1957, Krapovickas and Rigoni describe the wild tetraploid species *A. monticola* and the obtention of fertile hybrids when crossing it with *A. hypogaea*.

With few exceptions, such as *A. guaranitica* and *A. tuberosa*, the species were very difficult to interpret due to the great apparent similarity they have with one another, to such an extent that in some cases it is practically impossible to separate them if information is unavailable on their biological form, corolla color, peg position and fruit morphology—information commonly absent from herbarium specimens.

To give some idea of these difficulties, we offer a few interpretations of names frequently found in the literature.

For example, the name *A. marginata* has been used to identify the following species: *A. marginata* (Bentham 1859, Chevalier 1933), *A. Oteroi* (Bentham 1859, Chevalier 1933, Hoehne 1940, Hermann 1954), *A. Burkartii* (Bentham 1859, Chevalier 1933, Burkart 1939, Hoehne 1940, Hermann 1954), *A. pseudovillosa* (Chevalier 1933, Hoehne 1940, Hermann 1954), *A. glabrata* var. *glabrata* (Chevalier 1933, Burkart 1939, Hoehne 1940, Hermann 1954) and *A. lignosa* (Hermann 1954).

The name *A. prostrata* has been used for: *A. prostrata* (Bentham 1859), *A. lutescens* (Bentham 1859), *A. stenosperma* (Bentham 1859, Hoehne 1940), *A. sylvestris* (Hoehne 1940), *A. Cardenasii* (Hoehne 1940), *A. Dardani* (Hoehne 1940), *A. hypogaea* (Hoehne 1940) and *A. glabrata* var. *glabrata* (Burkart 1939, Hermann 1954).

The name *A. glabrata* was used for: *A. glabrata* (Bentham 1859), *A. helodes* (Bentham 1859, Chevalier 1933, Hoehne 1940), *A. prostrata* (Chevalier 1933, Hermann 1954), *A. repens* (Chevalier 1933, Hermann 1954), *A. stenosperma* (Chevalier 1933, Hermann 1954), *A. pseudovillosa* (Hoehne 1940), *A. glabrata* var. *glabrata* (Hoehne 1940, Hermann 1954), *A. glabrata* var. *Hagenbeckii* (Hoehne 1940, Hermann 1954), *A. Archeri* (Hermann 1954), *A. appressipila* (Hermann 1954) and *A. Dardani* (Hermann 1954).

The name *A. pusilla* was used for: *A. pusilla* (Bentham 1859, Chevalier 1933, Krapovickas & Rigoni 1957), *A. Dardani* (Bentham 1859, Chevalier 1933, Hermann 1954), *A. sylvestris* (Chevalier 1933), *A. monticola* (Burkart 1939, Krapovickas & Rigoni 1951) and *A. duranensis* (Burkart 1939, Krapovickas & Rigoni 1957).

In response to this chaotic situation, we began in 1959 a methodical exploration to try to collect herbarium specimens and living plants in the type localities of all the species described up to that point and wherever else a herbarium specimen of *Arachis* had been made.

This new material was studied from different perspectives. To the field observations were added data from interspecific crosses (Gregory, W.C. & Gregory 1967, Gregory, M.P. & Gregory 1979), chromosome studies (Smartt 1964), chromatography (Krapovickas & al. 1973, Krapovickas & al. 1974) and palynological studies (Pire 1964).

In 1973, Gregory & al. enumerated the material of the wild species and cultivated peanut obtained during the aforementioned explorations and presented an outline in which names for sections within the genus were proposed.

Another approximation was offered (Krapovickas 1973) in a seminar given in 1969 in which, besides presenting a scheme for ordering the genus, various "genocenters" of cultivated peanut in South America were proposed.

A very important contribution towards the definition of the sections and establishing the phylogenetic relationships among them was based on the results of diallelic crosses made using material from 100 sources (Gregory, M.P. & Gregory 1979). In light of this information's great value in the delimitation of the taxa, we reprint all of the crosses obtained, with the updated species names, in the chapter "Interspecific Crosses Conducted" (p. 195).

Resslar (1980) compares the attempts at ordering the genus *Arachis* of Gregory & al. (1973) and Krapovickas (1973), and introduces one more name: sect. *Goniorhiza*, appearing in a mimeographed note (Krapovickas 1969b), and therefore not effectively published (Art. 29 of the International Code of Botanical Nomenclature).

Recently, Smartt (1990) did an excellent job of bringing things up to date by compiling and analyzing the existing information about *A. hypogaea* and its relationship with the wild species.

History of the Collections

Up until 1841, the year in which Bentham described the first wild species of *Arachis*, the only known species was *A. hypogaea* L., the cultivated peanut, described by Linnaeus in 1753. The five species described by Bentham were the product of collections made by travelers in Brazil at the beginning of the 19th Century. Johann E. Pohl was in Trahiras (Oct. 18-24, 1819), Goiás, where he collected *A. prostrata*. Ludwig Riedel passed by Rio Pardo, in Mato Grosso do Sul (Oct. 1826), where he collected the type specimens of *A. glabrata* and *A. tuberosa*. Jacques S. Blanchet, who began collecting in Bahia in 1828, collected *A. pusilla* at "Serra Jacobina." In 1832, James Tweedie traveled the Uruguay River where he encountered *A. villosa*.

George Gardner, in October of 1839, discovered *A. marginata* at "Mission of Duro" (today Dianópolis in the state of Tocantins), a species that Gardner himself described in 1842.

When Bentham (1859) published the *Arachis* treatment in the Flora Brasiliensis of Martius, very few collections were added. Among these were the collections of Gaudichaud in Rio de Janeiro (*A. stenosperma*), Arsène Isabelle in Rio Grande do Sul (*A. Burkartii*), Manso in Cuiabá, Mato Grosso (*A. helodes*), Martius in northeast Brazil, Saint Hilaire in southern Brazil and Uruguay (*A. Burkartii*, *A. glabrata* and *A. villosa*) and Weddell in Mato Grosso (*A. lutescens*). All of these herbarium specimens lack the subterranean portions of the plants, for which, in general, they have been misinterpreted.

A hefty increase in knowledge about the genus *Arachis* was produced with the collections made by E. Hassler in Paraguay, published by Chodat & Hassler (1904). Notable among the 20 collections made by Hassler are the new species *A. guaranitica*, *A. paraguariensis*, *A. lignosa* and *A. pseudovillosa*, as well as demonstrating the ample distribution of *A. glabrata* in eastern Paraguay.

In September of 1908, Cesar Diogo collected a wild *Arachis* around Lagoa Gahiba, on the Paraguay River north of Corumbá, that Hoehne (1919) would later name *A. Diogoi*.

Between 1908 and 1914, F. C. Hoehne and J. C. Kuhlmann participated in the exploration of Mato Grosso by the Comissão Rondon. The scantiness of their collections is conspicuous --only eight specimens-- and was surely due to the fact that the route of the telegraph line, the principal objective of the Comissão Rondon, took them over the higher parts of the Serra dos Parecis, an obstacle that constitutes the northern limit of the genus *Arachis* in Mato Grosso. Kuhlmann collected *A. glabrata* in Diamantina and *A. nambyquarae* in Pimenta Bueno. Hoehne collected *A. Hoehnei* in Amolar and *A. appressipila* in Corumbá, on the Paraguay River.

Two singular events occurred during the War of the Chaco, between Bolivia and Paraguay. In October 1934, M. Cárdenas, a member of the health services of the Bolivian army, discovered *A. Cardenasii* in Roboré, not far from the front. In March 1935, T. Rojas,

who accompanied the vanguard of the Paraguayan army, collected *A. duranensis* in Carandayti, shortly before the end of the war (14 June 1935).

In December 1932 and January 1933, Jorge Ramos de Otero, who was interested in studying the grazing potential of Mato Grosso, made his first trip to Campo Grande where he collected *A. Archeri*, *A. Martii* and *A. Oteroi* for the first time.

F. C. Hoehne and A. Gehrt collected *A. Oteroi* and *A. Archeri* in Campo Grande (5 August 1936), which they cultivated at the Instituto de Botánica de São Paulo and at the Instituto Agronômico de Campinas.

An important trip was made by W. Andrew Archer of the USDA who visited Campo Grande (MS) with A. Gehrt (1-11 September 1936) where he collected *A. glabrata*, *A. Archeri*, *A. Oteroi* and *A. Benthamii*. He later traveled to Rio Grande do Sul and to Uruguay (Rivera) (11-15 November 1936) to collect *A. Burkartii*. He then went into Argentina where, after visiting the Botanical Garden of the Facultad de Agronomía de Buenos Aires (27 November 1936), he collected samples of *A. villosa* and then traveled to Misiones where, in Posadas and the surrounding area (10 December 1936), he collected *A. glabrata*. From there, Archer crossed into Paraguay to collect in Encarnación (14 December 1936), Villa Rica (16 December 1936) and the area around Asunción (24 December 1936 - 9 January 1937) where he made herbarium specimens of the two varieties of *A. glabrata*. He ended his collection with *A. villosa* which he found in Colonia, Uruguay, on 17 January 1937.

In 1939, J. Ramos de Otero returned to Mato Grosso. Between April 14 and May 28 he collected along the Amambay River and at Campanario, Ponta Porã, Bela Vista, Aquidauana and Campo Grande (Otero 1941, 1952).

The material collected by Otero, Hoehne and Archer was utilized by F. C. Hoehne for his monograph of the genus *Arachis* (Hoehne 1940) and by A. J. T. Mendes (1947) for the first chromosome counts of wild peanut species, determining that 2n=20 in *A. Oteroi*, *A. Benthamii*, *A. Archeri*, *A. major* and *A. villosulicarpa*.

Between 14 November 1947 and 11 April 1948, a trip was conducted by J. L. Stephens (Division of Plant Exploration and Introduction, USDA) and W. Hartley (CSIRO, Australia) with the principal objective of collecting seeds and living plants of cultivated peanut varieties as well as wild species of *Arachis* (Hartley 1949). They collected wild species in northern and central Corrientes, southern Misiones and northeastern Entre Ríos (Argentina); in Rivera and Colonia (Uruguay); in Asunción, Paraguarí, Puerto Casado and Villa Rica (Paraguay); and in Cuiabá (Mato Grosso, Brazil). The herbarium material was used by Hermann (1954) for his synopsis of the genus *Arachis*.

In Argentina, explorations dedicated to the collection of *Arachis* germplasm began in 1945 with the initiation of plant breeding programs at the Manfredi Agricultural Experiment Station (Cordoba) and with the organization of the Department of Plant Exploration and Introduction (DEIP) of the Ministerio de Agricultura de la Nación, under the direction of E. C. Clos.

The first introductions of wild peanuts are owed to J. R. Báez and V. A. Rigoni (director and subdirector, respectively, of the Manfredi Experiment Station), who in 1947 obtained samples of *A. correntina* in northern Corrientes, and to J. R. Báez who collected *A. villosa* in Colonia, Uruguay in 1949. Plants of *A. glabrata*, provided by the DEIP, were also available. This was the material with which V. A. Rigoni attempted the first interspecific crosses, obtaining the first hybrids between *A. hypogaea* and *A. correntina* (Krapovickas & Rigoni 1949, 1951).

In May of 1950, Báez, Rigoni and Krapovickas traveled to the provinces of Salta and Jujuy (Argentina) where, after visiting several localities where herbarium specimens had been made of wild species, they were only able to find a few plants at Yala (Jujuy) which served as the basis for the description of *A. monticola* (Krapovickas & Rigoni 1957).

In March of 1953, Rigoni, Pietrarelli and Krapovickas made a trip to Corrientes and Misiones (Argentina) to collect living specimens of wild species and samples of

cultivated peanuts.

In May of 1953, Krapovickas collected some fruits at Campo Durán (Salta, Argentina) that later produced plants of *A. duranensis*.

In 1954-1955, Krapovickas, thanks to a grant from the Guggenheim Foundation, had the opportunity to study herbarium specimens at Brazilian and North American institutions, that enabled him to plan future explorations.

In January and February of 1958, with funds from the Instituto Miguel Lillo of Tucumán (Argentina), Krapovickas traveled to Bolivia where he searched between Cochabamba and Santa Cruz, without success. He began encountering wild species of *Arachis* in Santa Cruz de la Sierra (*A. Rigonii*), in Roboré (*A. Cardenasii*) and along the Parapetí River (*A. Batizocoi*).

With financial support from their respective institutions, W. C. Gregory (USDA), J. R. Pietrarelli (INTA) and A. Krapovickas (CONICET), undertook an extensive exploration, between January and April of 1959, with the objective of obtaining living material from wherever herbarium specimens of *Arachis* had been collected, trying as much as possible to visit the type localities. The itinerary of Corrientes, Posadas (Argentina); Encarnación, Asunción, Caacupé, Puerto Embalse, Asunción, P. J. Caballero (Paraguay); Ponta Porã, Bela Vista, Amambai, Campo Grande, Aquidauana, Porto 15 de Novembro, Campo Grande, Rondonópolis, Cuiabá, Rosario Oeste, Chapada dos Parecís, Cuiabá, Jataí, Ituiutaba, São Paulo, Corumbá (Brazil); Roboré, Santa Cruz (Bolivia); and Salta (Argentina) was traveled using various means of transportation. When an automobile was available, stops were made every ten km, as was the case between Corrientes and Posadas, and in Mato Grosso and Minas Gerais (Pietrarelli 1961).

Between April 3 and May 8, 1961, W. C. Gregory, J. R. Pietrarelli and A. Krapovickas visited São Paulo, Ituiutaba, Capinópolis (Mato Grosso); Itumbiara, Caldas Novas, Piracanjuba, Anápolis, Niquelândia, Ceres, Brasilia, Formosa, Dianópolis (Goiás); Barreiras (Bahía); Brasilia, Patos de Minas, Tres Marias, Diamantina, Sete Lagoas (Mato Grosso); and São Paulo. Then, between May 11-19, 1961, W. C. Gregory and A. Krapovickas traveled in Mato Grosso to Rio Brilhante, Dourados, Ponta Porã; and in Paraguay to P. J. Caballero, Ñu Porá, Concepción and Puerto Casado.

In 1967, Gregory and Krapovickas traveled to northeast Brazil, where they visited Bahia, the eastern part of Pernambuco and the northwest of Ceará.

The trips from 1959 to 1967 are discussed by Gregory (1973). The numbers assigned to the collections are from the herbarium of Krapovickas, with the collectors listed on the specimens in alphabetical order: Gregory, Krapovickas and Pietrarelli.

Between April and June of 1968, R. O. Hammons and W. R. Langford (CRD, ARS, USDA) traveled to Argentina, Brazil and Uruguay. Together with J. R. Pietrarelli (EEA Manfredi, Cordoba), they explored the departments of Colonia, Salto, Rivera and Tacuarembó in Uruguay. With the collaboration of Krapovickas, they traveled to the following localities: Corrientes (Argentina); Uruguaiana, Porto Alegre, Itajaí, Curitiba, Antonina, São Paulo, Porto 15 de Novembro, Campo Grande, Aquidauana, Bela Vista and Ponta Porã (Brazil). One of the most important acquisitions made was that of *A. stenosperma*, collected in Antonina and Paranaguá, thanks to the collaboration of G. Hatschbach, of Curitiba.

From May 1 to June 9, 1971, with funding from FAO, Rome, Italy, A. Krapovickas, L. A. Mroginski and A. Fernández traveled to Orán (Salta, Argentina) and from there crossed into Bolivia to make the journey between Bermejo, Tarija, Villa Montes and Yacuiba. They encountered wild *Arachis* species only in the Bolivian "chaco," near Villa Montes, where they collected *A. ipaënsis* and *A. duranensis*.

A proper analysis of the germplasm is presented by Banks (1976), which shows the need to make additional collections of the cultivated peanut and the wild species before the destruction of their present habitats occurs.

With the support of the International Board for Plant Genetic Resources (IBPGR); FAO,

Rome; and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, A.P., India, another 17 expeditions were undertaken between 1976 and 1983 to the centers of origin and diversity of *Arachis* in South America, surveying the entire area of distribution of the genus (Simpson 1984b, Valls & al. 1985). These trips were conducted with the added participation of C.E. Simpson (Texas A&M University, Stephenville, Texas, U.S.A.), J. F. M. Valls, A. C. Allem and L. Coradin of the Centro Nacional de Recursos Genéticos (CENARGEN-EMBRAPA), Brasilia, Brazil, which contributed its infrastructure to ensure the success of these expeditions.

Summary of Germplasm Explorations

Year	Date	Team*	Region Explored
1932-33	24/Dec-30/Jan	O	BRASIL, MS.
1936-37	18/Jul-17/Jan	Ar	ARGENTINA, BRASIL, PARAGUAY, URUGUAY.
1939	14/Apr-28/May	O	BRASIL, MS (Otero 1941, 1952).
1947-48	14/Nov-11/Apr	StHt	ARGENTINA, BRASIL, PARAGUAY, URUGUAY (Hartley 1949).
1947		BaRi	ARGENTINA, Corrientes.
1950	20-26/May	BaRiK	ARGENTINA, Salta, Jujuy.
1953	1-13/Mar	RiKP	ARGENTINA, Corrientes, Misiones, E.Ríos.
1953	27-31/May	K	ARGENTINA, Salta, Campo Durán.
1958	3/Jan-28/Feb	K	BOLIVIA, Cochabamba, S.Cruz, Roboré, Parapetí.
1959	16/Jan-8/Apr	GKP	ARGENTINA, BOLIVIA, BRASIL, PARAGUAY. (Pietrarelli 1961).
1961	20/Mar-20/May	GKP	BRASIL, MG, GO, BA, MS, PARAGUAY.
1967	28/Mar-21/Apr	GK	BRASIL, BA, CE, PE.
1968	16/May-14/Jun	HLPK	ARGENTINA, BRASIL, URUGUAY. (Pietrarelli 1968, Krapovickas 1969a).
1971	1/May-9/Jun	KMoF	BOLIVIA, Bermejo, Tarija, Villa Montes.
1976	29/Nov-31/Dec	GKAOk	BRASIL, MS, MT. (Gregory 1977, Gregory & Simpson 1978).
1977	15/Mar-19/May	GKBSPSc	ARGENTINA, Salta, Jujuy.
			BOLIVIA, Yacuiba, Camiri, Sta.Cruz
		BPZ	BOLIVIA, S.Cruz, Cochabamba, La Paz.
		GKSSc	BOLIVIA, S.Cruz.
1977	9/Jun-7/Jul	GKPSc	PARAGUAY, Florida, Tobatí, Bella Vista.
			BRASIL, P.Porá, Pto.Murtinho, Corumbá. (Gregory 1977).
1978	31/May-13/Jun	S	ARGENTINA, Mdi, Ctes, BRASIL, IAC. (Gregory & Simpson 1978).
1979	28/Mar-30/Apr	GKSPScGb	BOLIVIA, Sta.Cruz, Trinidad. (Gregory 1979).

Year	Date	Team*	Region Explored
1980	26/Mar-10/May	KSBScCo	NW ARGENINA, BOLIVIA. (Simpson 1980).
		BZC	BOLIVIA, Sta.Cruz, La Paz.
		BZCJk	BOLIVIA, La Paz.
		KSSc	BOLIVIA, Sta.Cruz, S.Matías, S.José.
1980	10-24/May	SPAi	PERU, Lima, Cuzco, Quillabamba. (Simpson 1981).
1981	10-7/Jun	VVeSv	BRASIL, GO, BA, PE.
1981	28/Apr-3/Jun	SPZ	PERU, Lima, T.María, Tarapoto, Iquitos, Ayacucho.
1981	14/Aug-9/Sep	VSGr	BRASIL, GO, MT. (Simpson 1981).
1981	27/Sep-10/Oct	PZi	BOLIVIA, La Paz, Beni, Chuquisaca. (Pietrarelli 1982).
1982	9-22/Mar	ScVn	ARGENTINA, Salta, Jujuy.
1982	2-21/Mar	VKRSv	BRASIL, GO, BA, PI, PE.
1982	17/Apr-16/May	VSW	BRASIL, GO, MG, BA. (Simpson 1982).
1983	5-20/May	VKSvVe	BRASIL, BA, PI. (Valls 1983).
1983	18/Apr-11/May	KSScCr	BOLIVIA, Tarija. ARGENTINA, Salta.
1983	10-30/May	VSMSvGe	BRASIL, MG, RS, PA, SP, RJ. (Simpson 1984a, Valls 1984).
1983	10-24/May	BPZ	ECUADOR. (Banks 1984).
1984	10-28/Apr	VRGeSv	BRASIL, MG, MT.
1984	31/Jul-2/Sep	VSGdSaW	BRASIL, GO, MT. (Simpson 1986a).
1985	6-17/Mar	B	PERU, Lima, Casma, Chibote, Trujillo. (Banks 1985).
1985	14-28/Mar	VVeSv	BRASIL, GO, TO, MA, PI.
1985	15-26/Apr	VPoPeJAj	BRASIL, MS.
1985	11/May-10/Jun	VKSSv	BRASIL, MT, RO. (Simpson 1986b).
1985	9-29/Oct	VPoBi	BRASIL, MS, MT.
1986	15/Mar-15/Apr	VSW	BRASIL, MS, MT, GO. (Simpson 1987).
1986	22/Oct-4/Nov	VPoJSv	BRASIL, MT, MS.
1987	16-30/Apr	VRSv	BRASIL, BA, PE, CE, PI.
1988	Jun	VQFdSv	BRASIL, MS.
1988	8/Sep-13/Dec	Wi	BOLIVIA, S.Cruz, Beni, La Paz, Pando. (Williams 1989).
1989	24-25/Jan	VK	BRASIL, MT.
1989	10/Jun-5/Oct	Wi	BOLIVIA, S.Cruz, Beni.
1990	26/Jul-10/Sep	Wi	BOLIVIA, Beni. (Williams 1991).
1990	Jun	VGaRoSv	BRASIL, MT.
1991	May	VFaPzSv	BRASIL, MG.
1992	May	VPzVaW	BRASIL, MG.
1992	May	VSPmWiSv	BRASIL, SP.
		VSPmPzRs	BRASIL, GO.
1992	11-29/Sep	Wi	BOLIVIA, La Paz, Sud Yungas.

* For key to participants' names see page 194.

The Fruit of *Arachis* and its Capabilities

The genus *Arachis* is characterized by the fact that all of its species are geocarpic, that is, they only produce underground fruit. The first author to correctly explain fruit development in *A. hypogaea* was Poiteau (1802, 1806). He

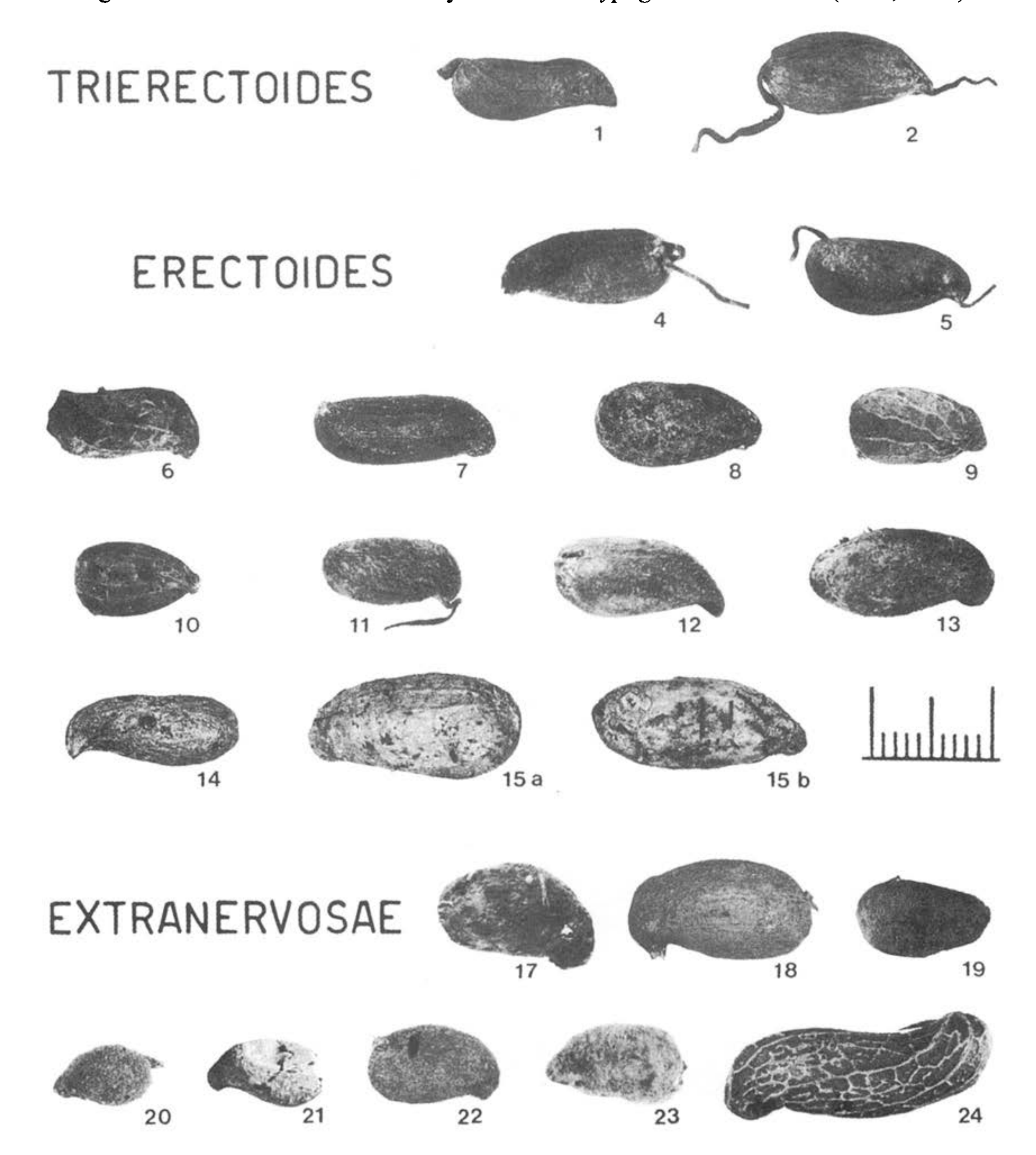


Fig. 1. Fruit articles: 1, *A. guaranitica* (V.7704). 2, *A. tuberosa* (K.34497). 4, *A. brevipetiolata* (G.10138). 5, *A. Oteroi* (G.10541). 6, *A. Hatschbachii* (G.9863). 7, *A. cryptopotamica* (K.30026). 8, *A. major* (K.30022). 9, *A. Benthamii* (G.9761). 10, *A. douradiana* (G.10554). 11, *A. gracilis* (G.9772). 12, *A. Hermannii* (G.9841). 13, *A. Archeri* (G.9835). 14, *A. stenophylla* (K.30013). 15a, *A. paraguariensis* ssp. *paraguariensis* (K.30013). 15b, *A. paraguariensis* ssp. *capibarensis* (K.30134). 17, *A. Macedoi* (G.10127). 18, *A. marginata* (V.6652). 19, *A. prostrata* (G.10240). 20, *A. lutescens* (V.7741). 21, *A. retusa* (V.9950). 22, *A. Burchellii* (V.6556). 23, *A. Pietrarellii* (V.9000). 24, *A. villosulicarpa* (V.8818, without the villous epicarp). Scale = 1 cm.

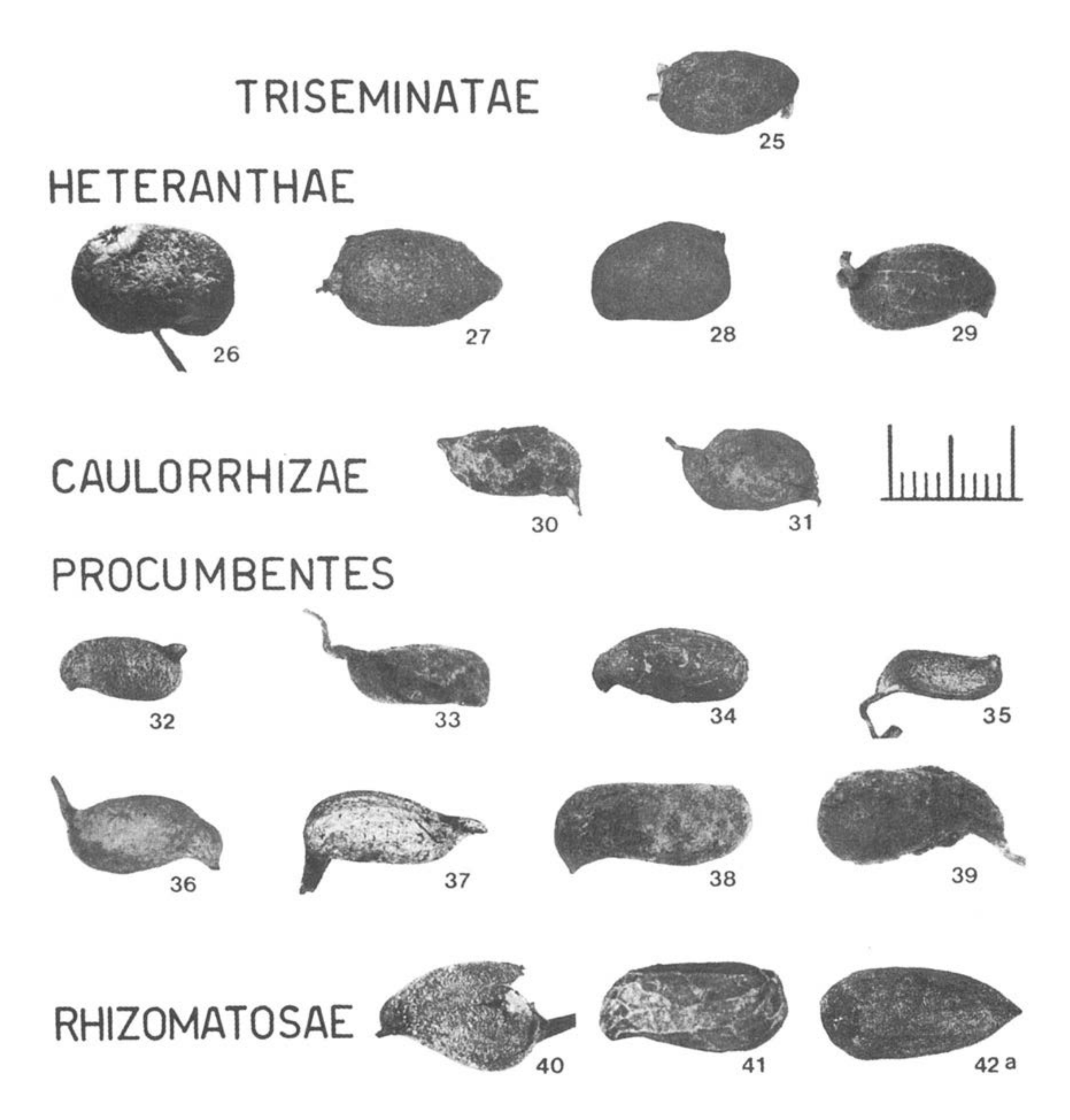


Fig. 2. Fruit articles: 25, *A. triseminata* (V.6772). 26, *A. Giacomettii* (W.201). 27, *A. sylvestris* (V.6767). 28, *A. pusilla* (V.6110). 29, *A. Dardani* (V.10963). 30, *A. repens* (Conagin 1). 31, *A. Pintoi* (V.6728). 32, *A. lignosa* (K.14248). 33, *A. Kretschmeri* (V.7631). 34, *A. Rigonii* (G.10034). 35, *A. chiquitana* (K.36027). 36, *A. matiensis* (V.6324). 37, *A. appressipila* (K.30003). 38, *A. Vallsii* (V.8678). 39, *A. subcoriacea* (V.8922). 40, *A. Burkartii* (K.38473). 41, *A. pseudovillosa* (G.10566). 42a, *A. glabrata* var. *glabrata* (K.30135). Scale = 1 cm.

studied the plant in 1797 in Santo Domingo and described the flower with its calyx tube at whose base is found the sessile ovary which, after flowering, is borne by a stipe or pedicel that elongates considerably towards the soil where the fruit will mature. Nevertheless, various other interpretations were refuted by Poiteau himself (1853) and enumerated by Smith (1950), who made an in-depth study on the flowering and fruiting of *A. hypogaea*, confirming Poiteau's observations.

In the flower of *A. hypogaea*, the ovary is sessile and has a basal meristem that, after fertilization, grows and gives rise to a

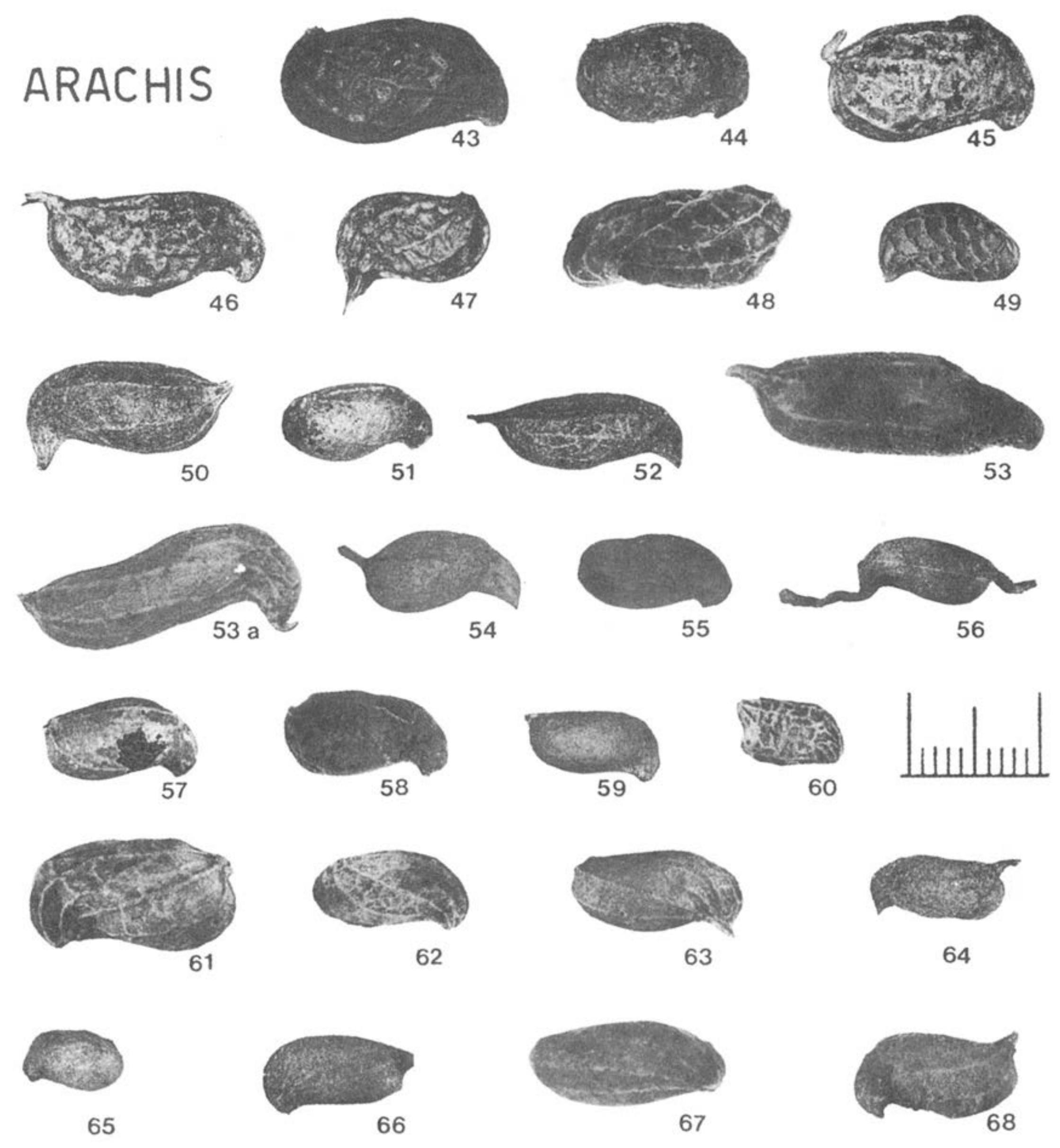


Fig. 3. Fruit articles: 43, *A. glandulifera* (K.30091). 44, *A. cruziana* (K.36024). 45, *A. monticola* (K.30062). 46, *A. magna* (K.30093). 47, *A. ipaënsis* (K.30076). 48, *A. valida* (V.9153). 49, *A. Williamsii* (Wi.1118). 50, *A. Batizocoi* (K.30083). 51, *A. duranensis* (K.30067). 52, *A. Hoehnei* (K.30006). 53, *A. stenosperma* (V.7382-Atlantic coast). 53a, *A. stenosperma* (V.7762-Mato Grosso). 54, *A. praecox* (V.6416). 55, *A. palustris* (V.6536). 56, *A. benensis* (Wi.860). 57, *A. trinitensis* (Wi.1117). 58, *A. decora* (V.9955). 59, *A. Herzogii* (K.36029). 60, *A. microsperma* (V.7681). 61, *A. villosa* (HLP.8). 62, *A. helodes* (G.9926). 63, *A. correntina* (K.7830). 64, *A. Simpsonii* (K.36009). 65, *A. Cardenasii* (K.36016). 66, *A. Kempff-Mercadoi* (K.30088). 67, *A. Diogoi* (G.10602). 68, *A. Kuhlmannii* (V.8935). Scale = 1 cm.

postfloral axis or peduncle that carries at its apex the ovary with the fertilized ovules. Once the ovary is buried, it develops, producing a unilocular legume that encloses from 2 to 5 seeds or, through abortion, only one. Smith (1950: 806) gives morphological reasons for discarding the term gynophore that is used to describe the peduncle, commonly known in English as the "peg" (*paxillus* in Latin) and in Spanish "clavo," a

term used by farmers.

In the wild species, the fruit is articulated or lomentiform, with two articles, as in the majority of species, or with three as in *A. triseminata* (Krapovickas & Rigoni 1957: 436, fig. 1; Gregory & al. 1973: 68). The articles are separated by an intercalary peg or isthmus of various centimeters in length. The articles of the fruit mature successively. The proximal article develops first and, when it acquires a certain size, an intercalary meristem that will form the isthmus develops in the apex. The isthmus will grow in a horizontal position or downward, as did the peg, according to the sections of the genus. This isthmus has a similar appearance to the peg, with the difference that it carries only a single ovule at its apex in the two-seeded fruits, or two in *A. triseminata*. The unequal development of the ovules with the formation of an intercalary tissue of a structure similar to the peg, was observed by Conagin (1959: 58, fig. 3).

In *A. hypogaea* the isthmus is missing but the seeds grow differentially, as in the wild species, although much closer in time to one

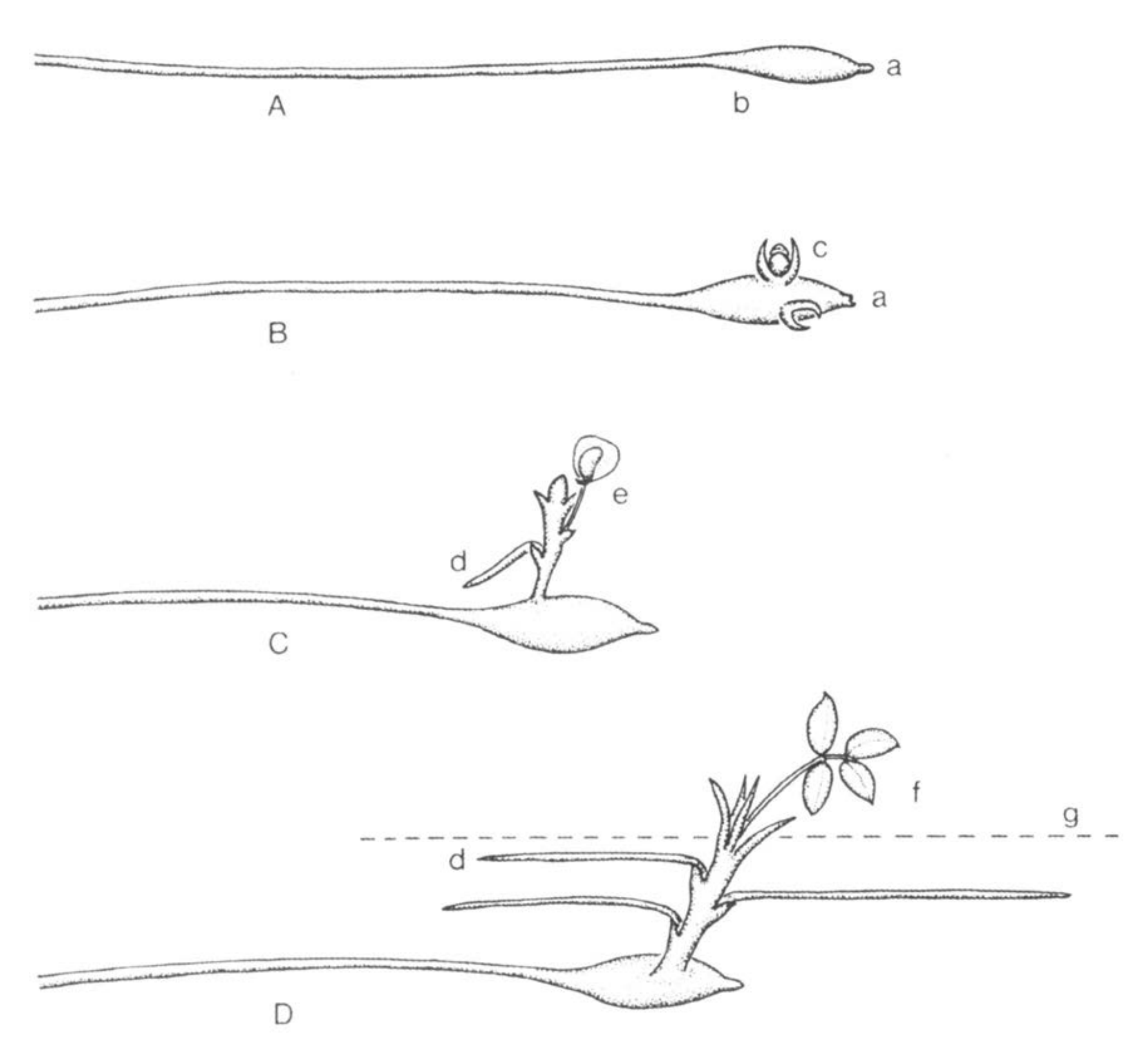


Fig. 4. A-D, Development of buds on the tips of the peg in *A. paraguariensis* ssp. *paraguariensis*: a, destroyed ovary; b, hypertrophy of tissue next to the ovary; c, adventitious floriferous buds; d, pegs of the new flowers; e, subterranean flower; f, leaf of the adventitious bud; g, soil level (KC 11488, cult. Alva, 1993).

another, giving the impression of simultaneous maturation. Smith (1956: 236) demonstrated that in both "Virginia" and "Spanish" peanuts, the embryo and the endosperm of the distal seed do not grow as quickly as those of the proximal seed of the same fruit.

The peg not only has the role of interring the fertilized ovules and of distancing the seeds from the mother plant, but it also has some very peculiar abilities. In the section *Extranervosae*, many species frequently produce adventitious roots on the pegs, as was observed in *A. villosulicarpa* (Gregory 1946: 42, fig. 26). These roots can form tubers similar to those of the mother plant and can also form shoots. The formation of shoots on roots was observed only in the sections *Extranervosae* and *Erectoides*, and the formation of shoots on pegs only in the section *Extranervosae* (Gregory & al. 1973: 60).

In the section *Erectoides*, adventitious inflorescences were observed on the pegs (Gregory & al. 1973: 60).

In *A. paraguariensis* ssp. *paraguariensis*, material from specimen KC 11488, cultivated in Alva, FL (USA), one of us (W.C.G.) observed that when the ovary is destroyed at the tip of the peg, possibly by the action of nematodes, insects or fungi, or fertilization failure, the tissue becomes hypertrophied next to the ovary at the peg tip (fig. 4, A, b). On this swollen apex appear adventitious floral spikes (fig. 4, B, c), on which subterranean flowers are formed that manage to fertilize themselves and produce new pegs (fig. 4, C). In the event that the adventitious inflorescence emerges from the soil, it may produce leaves at its apex.

The production of flowers on pegs with damaged ovaries was also observed in species of the sections *Extranervosae* and *Arachis* (Simpson, pers. com.).

"Sosias[5]" or Twin Species

One of the greatest difficulties presented by the genus *Arachis* is the existence of species so similar to one another that they are practically indistinguishable without all of the plant parts, many times missing on herbarium specimens. Some cases are so striking that they are worth pointing out.

Arachis pusilla vs. *A. duranensis*. These two species are very much alike, both in the wild and as herbarium specimens. The first lives along the length of the São Francisco River in the Brazilian state of Bahia and the second grows in northwestern Argentina and southern Bolivia. The differences are found primarily in the flowers: dimorphic with the standard having reddish lines on both faces in *A. pusilla*, and normal flowers with reddish lines only on the ventral face of the standard in *A. duranensis*.

Arachis monticola vs. *A. magna*. These two species are almost indistinguishable. The living plants look alike, the distribution of tomentum is similar in both, and both have fruits whose articles are the same size and with a strongly reticulate pericarps. Both species belong to the section *Arachis*, but *A. monticola* is tetraploid and has the small pair of chromosomes characteristic of the species related to *A. hypogaea*. *Arachis magna*, on the other hand, is a diploid that is lacking the small pair of chromosomes.

Arachis helodes vs. *A. lignosa*. Both species have the same habit, with procumbent branches, leaves of the same shape and size, almost completely glabrous. The first lives in the vicinity of Cuiabá, in Mato Grosso, and the second along the Paraguay River north of Concepción, in northern Paraguay. The most important morphological difference is the growth of the peg: nearly vertical in *A. helodes*, and horizontal, very long and superficial in *A. lignosa*. Still, they are very different cytologically. Although both have 20 chromosomes, *A. helodes* has the large satellite and the small pair of chromosomes, while *A. lignosa* has a dot-like satellite and is lacking the small pair.

Intraspecific Variability

Another problem presented by the

[5] "Sosia" is a term used by Monteiro Filho (1949: 509); from the dramatist Plautus, Sosia resembled another character with whom he could be easily confused.

taxonomy of the genus *Arachis* is its intraspecific variability. There is some proof of its existence.

In *A. triseminata*, a very uniform and easily distinguishable species, upon crossing two accessions from locations 20 km distant from one another, in the neighborhood of Juazeiro, in Bahia (parents 97 x 98), hybrids were obtained with 50.7 and 68.2% stained pollen. These values indicate the presence of some genetic barrier unrelated to exomorphological characters.

Upon crossing two accessions of *A. glabrata* var. *glabrata* separated from one another by 20 km between Encarnación and Trinidad in southeastern Paraguay (parents 10 x 84), a hybrid was obtained with a high degree of sterility, with 12.9% pollen stained. In seven other crosses, involving accessions much more distant from each other, the hybrids produced pollen that stained between 45.2 and 92.9%. We are dealing with a taxon that has plenty of variability, both exomorphological and genetic.

In accessions of *A. valida* coming from the same locality, collected at the same place but on different dates, it was found that one (KG 30011) had a "B" chromosome with a satellite, while the other (KGPSc 30147) had two morphologically different "B" chromosomes. These two accessions grown in Manfredi are exomorphologically identical (Fernández & Krapovickas 1994).

In *A. monticola*, morphologically distinct "B" (SAT) chromosomes were observed in two accessions collected in Yala (BaKRi 7264) and in Lozano (KG 30063), localities in the province of Jujuy (Argentina) separated by only 5 or 6 km (Fernández & Krapovickas 1994).

Arachis duranensis is a taxon with a fairly uniform appearance that shows a great deal of variability unrelated to the geographic distribution of the accessions. In a recent work (Bianchi-Hall & al. 1993), 14 accessions of this species were analyzed electrophoretically and these showed great variability, to such a degree that these accessions are distributed randomly in the illustration presented (Bianchi-Hall & al. 1993: 9, fig. 2) and there are no two accessions that show a total similarity of bands. An interesting case is that of samples 30065, 30067 and 30068, collected between Senda Hachada and General Ballivián, in the northeastern part of the province of Salta (Argentina) along a 20 km stretch of the Seco River, in which, of the 22 bands involved only 8 (36%) coincided. The samples 30065 and 30067 were collected only 3 km apart and in these, of the 18 bands involved, 13 (72%) coincided. On the other hand, the accessions that demonstrate greatest similarity in the bands are 7988 (Campo Duran, 500 m) and 36036 (city of Salta, 1250 m), localities separated by some 400 km. The two localities belong to different watersheds: the Itiyuro River that passes by Campo Duran and pertains to the watershed of the Bermejo River; and the Arias River that passes through the city of Salta and pertains to the watershed of the Salado or Juramento River.

The karyotypes of nine accessions of *A. duranensis* also show variability that is not associated with either geographic distribution or with electrophoretic bands of seed proteins (Fernández & Krapovickas 1994).

Reproductive Strategies and Speciation

Arachis is a genus in which all of its species produce only subterranean fruit. One could say that these species are "pegged" to the soil, and beneath the soil they have produced a great differentiation. There is variability in the roots, and there are rhizomes, stolons and branches produced from adventitious buds on the roots. There is variation in the position and growth of the pegs. On the pegs, which are a part of the fruit, there can form adventitious roots, shoots and also floral buds. Due to these characteristics, the species of *Arachis* can disperse their seeds no farther than 1 m, and often less. Occasionally the seeds are transported by water during floods and can be carried by animals, and possibly by humans, to become "pegged" again in a new place. Self pollination is the norm, although the flowers are visited sporadically by insects of limited radius of action, and there is evidence of parthenogenesis. Under these

conditions the rate of speciation depends directly upon the rate of mutation and upon the accumulation of old mutations. Gene flow is very limited and restricted to within small populations. We rarely observed extensive populations; what is usually seen is the formation of small populations due to their adaptation to special, primarily sandy, soil types. In this manner, the species of *Arachis* behave as apomictic species despite their sexuality, due to a gene flow that is restricted within small populations and almost non-existent between populations separated from one another.

It can be expected that random changes occur within the same species at different isolated localities and that mutations are accumulated with visible effects, as well as intra-chromosomal transpositions of important DNA sequences that make meiotic pairing difficult.

A good measure of this situation is given by the results of crossing experiments (Gregory, M.P. & Gregory 1979) that show low percentages of pollen staining in some crosses between accessions of the same species from different localities.

It is very difficult to establish the extent to which the lack of fertility of the hybrids is due to a specific or intraspecific level of parental differences. Nevertheless, it is highly valuable information for determining the degree of genetic isolation. Above 50% pollen stainability, the dehiscence of the anthers is normal. Below 50% the anthers begin to open with difficulty. Around 25% the anthers are no longer dehiscent but their pollen may be captured by bees. Below 15% the anthers have to be dissected to extract the pollen for staining. Below 10% it is questionable if the few grains that do stain could function in pollination.

To define or delimit the species one must reconcile or harmonize the exomorphology with all the other information, such as genetic, chromosomal or geographic, because none by itself would suffice in absolute terms.

The ability to produce experimental hybrids is of great importance for detecting affinities and was used in large measure to establish or confirm the sections. A greater ability to cross was observed in peripheral, isolated species such as *A. Rigonii*, *A. duranensis* and *A. paraguariensis*. It is possible that, in these cases, the selection pressure was not sufficient to raise genetic barriers whose presence would not have been necessary as an isolation mechanism in these allopatric species.

The percentage of fertility in the hybrids allows evaluation of the genetic barriers that can be very important in speciation in sympatric populations. Nevertheless, there are some evident examples of low percentages of pollen staining in hybrids obtained with parents that we suppose belong to the same species due to their very similar appearance. The barrier is not always associated with exomorphological differentiation, it could be genetic as in *A. duranensis*, or geographic as in *A. stenosperma*.

The chromosomes are good indicators. For example, the ploidy level is indispensable for separating the two series of the section *Rhizomatosae* or for defining *A. monticola*. The morphology of the "B" (SAT) chromosome gives very good information. For example, the presence of a dot-shaped satellite is highly important for delimiting the section *Procumbentes*, but dot-shaped satellites are also found in *A. sylvestris* and *A. benensis*, species that, based on exomorphology, have other affinities. The presence of the "A" chromosome, or small pair, is an unsurpassable indicator of genetic affinity with *A. hypogaea*, but it does not seem to be associated with any exomorphological character so as to be useful taxonomically.

All of this information has permitted, in many cases, the appraisal of exomorphological characters that would have otherwise passed unnoticed.

There are cases in which the combination of the available information was not sufficient and it was preferred to adopt a conservative position, thereby leaving some taxa with provisional solutions. Such is the case with *A. sylvestris* and *A. benensis*, whose placement in their respective sections is not definitive.

Some species have a broader distribution when related material is included in the lists. In these cases we have divided the studied material.

Dispersion

We consider that the genus *Arachis* originated in the Sierra de Amambay, on the border between Mato Grosso do Sul (Brazil) and Paraguay, where *A. guaranitica* grows, possibly the oldest species of the genus (Gregory & al. 1980). It is difficult to understand how this genus could have extended its range some 4000 km, both towards the NE, up to the Amazon, as well as to the W, up to the Andes.

By its own means, no species of *Arachis* can propagate itself more that one meter's distance per year due to its peculiar type of fruiting. To cover 4000 km, a theoretical minimum of 4,000,000 years would be required. And so, there must have been other means of dispersal that explain the ability to occupy an area as extensive as the one that the genus inhabits in South America.

Fluvial dispersion must be very important, such that many of the species have a distribution associated with the watershed of the great Paraguay, Uruguay and Paraná or São Francisco Rivers. The species generally live near watercourses, in places where the water evidently reaches only during the higher floods. In *A. hypogaea* the mature fruits can float, such that in India a harvesting technique was developed in which the peanut field is flooded, the soil is disturbed and the fruits float to the surface where the wind carries them to a corner where they are collected (Rusby 1901). It is conceivable that in this same manner fruits of wild species could be transported by water during floods.

Dispersal by animals should not be discarded. Birds, hogs, rodents and armadillos seek out the wild fruits. Although upon eating the seeds they destroy the embryo, the possibility exists of whole fruits being carried to their burrows. Names like "amendoím de carcará," "mundubí de carcará" (caracará peanut), or its equivalent "hire mat' ni" of the Carajás Indians of the Ilha do Bananal, reveal the predilection of the "carcará" bird (*Anhinga anhinga*) for the fruits of wild *Arachis*. The name "mendoim de porco" (hog peanut) also shows the appetite of this animal for wild peanut fruits. In some cases we have guided ourselves by the small excavations left by these animals in our search for wild species, as in the case of *A. ipaënsis*.

The action of humans must have been important. The domestication processes of *A. hypogaea* and *A. villosulicarpa* already implies a great understanding and management of wild peanuts by Amerindians. In northeastern Brazil, wild peanuts are called by names like "amendoim" of Portuguese origin, and "mendubí" or "mundubí" of Guaraní origin, while, on the other hand, cultivated peanut is known only by the name "amendoim," which suggests an earlier knowledge of the wild material. Children are in the habit of seeking and eating the fruits of wild peanuts such that, thanks to their help, we made our first collections of *A. monticola*.

There is a fact that proves the action of humans in the transport of wild peanut fruits. On the Pacific coast of Peru, in Bermejo (Dep. Ancash, 10°33'S, 77°53'W), in a prehistoric excavation, archeologists discovered remains of one-seeded peanut articles (12 mm long x 7 mm wide), with a slightly reticulate pericarp. Evidently we are dealing with some wild peanut that so far has not been collected in Peru. They are quite different from the archeological peanuts frequently encountered on the coast of that country which by their notable pod reticulation can be identified as *A. hypogaea* ssp. *hypogaea* var. *hirsuta*. The closest wild peanuts live in the Beni region of Bolivia, on the other side of the Andes. Of the three species that we know from that area, the most similar is *A. Williamsii*, from Trinidad, at 256 m elevation and 1500 km distant from Bermejo as the crow flies. The transportation by humans is evident in this case, to have been able to cross the barrier of the Andean Cordillera, whose passes are above 4500 m in elevation.

Transportation by human action is also a plausible explanation for interpreting the disjunct range of *A. stenosperma*.

The Sections of *Arachis*

In Diagram I we present the relationships between the sections of the genus *Arachis*, trying

to combine previous schemes (Krapovickas 1973; and Gregory, M.P. & Gregory 1979). The sections are ordered vertically according to their affinity with *Stylosanthes* and according to their ploidy level. Above the upper line are the tetraploids (2n=40) and below it are the diploids (2n=20). The sections are ordered according to the number of characters in common with *Stylosanthes*; on the lower part of the diagram are found the sections with greater affinity to that genus. On the horizontal axis we try to represent the geographic distribution, placing to the left those sections that reach the foothills of the Andes, and to the right the more eastern sections (figs. 5-9). This geographic scheme is valid for almost all the sections, except for the section *Arachis*, whose species cover a large part of the range of the genus, extending from the Atlantic coast (*A. stenosperma*) over to the Andes (*A. duranensis* and *A. monticola*).

The lines that unite the sections represent degrees of genetic affinity, according to the results of crossing experiments carried out by W.C. Gregory (1967) and M.P. Gregory & Gregory (1979) (see page 195). The drawing of the lines was done while trying to avoid, as much as possible, having them cut across one another.

Diagram I shows the greatest number of lines towards the left, while downwards and towards the right there is a marked reduction in them. No successful intersectional cross could be obtained with section *Triseminatae*; with *A. Burkartii* (R_1), the only diploid in the section *Rhizomatosae*; nor with the perennial species (A_2) and tetraploids (A_3) of the section *Arachis*.

Diagrams II, III and IV illustrate three of the species with best success in the crossing experiments, representing different sections. With these, *A. paraguariensis* ssp. *paraguariensis*, *A. Rigonii* and *A. duranensis*, almost all of the intersectional affinities that appear in Diagram I can be established. It is striking that all three of these species are from marginal areas. *Arachis paraguariensis* ssp. *paraguariensis* is the southernmost taxon in the section *Erectoides*, *A. Rigonii* is the westernmost species in the section *Procumbentes*, and *A. duranensis* is one of the most western species and one of the ones that grow at higher elevations in the Andes, of the section *Arachis*.

The sections *Trierectoides*, *Erectoides* and *Triseminatae* have species of erect or decumbent habit. In the rest of the genus the species have prostrate branches. The exception would be *A. appressipila*, the only species with a decumbent habit in the section *Procumbentes*.

The sections *Extranervosae* and *Heteranthae* have flowers whose standard has red lines on the interior face, as is frequent in *Stylosanthes*.

It is possible that these five sections, as they are located near the bottom of Diagram I, are the most primitive of the genus. This supposition is supported by the high degree of genetic isolation that is found among them and in the comparative morphology of the "B" (SAT) chromosome and the absence of the "A" pair (Fernández & Krapovickas 1994).

In the seven sections that are found towards the bottom of Diagram I, the peg of the fruit is very long and superficial, in contrast with the peg in the sections *Rhizomatosae* and *Arachis* that is shorter and growing in a vertical position or close to it.

Towards the top of the diagram are found the sections *Caulorrhizae* and *Rhizomatosae* with new methods of vegetative multiplication: stolons in the former and rhizomes in the latter.

It is possible that the annual character represents an adaptive advantage that permits avoiding adverse seasons such as the droughts in northeast Brazil (*Heteranthae*) and the droughts in the foothills of the Andes, as well as the flooding of the Paraguay River watershed (*Arachis* A_1).

It is noteworthy that fruits with reticulate pericarps only appear in two perennial species (A_2), various annual species (A_1) and in all of the polyploid species (A_3) of the section *Arachis* (fig. 3).

Arachis L.

Linnaeus, C., Sp. pl. 741, 1753. Linnaeus, C., Gen. pl., ed. 5, 329, 1754.

Arachidna [Plum.] Boehmer in C. G. Ludwig, Def. gen. pl. ed. 3, 255, 1760 *nom. illeg.* Moench,

Diagram I. Relationships between the sections of the genus *Arachis*.

ARACHIS A_3
A_2
A_1
RHIZOMATOSAE R_2
R_1
4 X
2 X
PROCUMBENTES
CAULORRHIZAE
ERECTOIDES
HETERANTHAE
TRIERECTOIDES
EXTRANERVOSAE
TRISEMINATAE

Diagram II. Crosses of *A. paraguariensis* ssp. *paraguariensis* with species of other sections. The numbers indicate the parent materials used in the crosses.

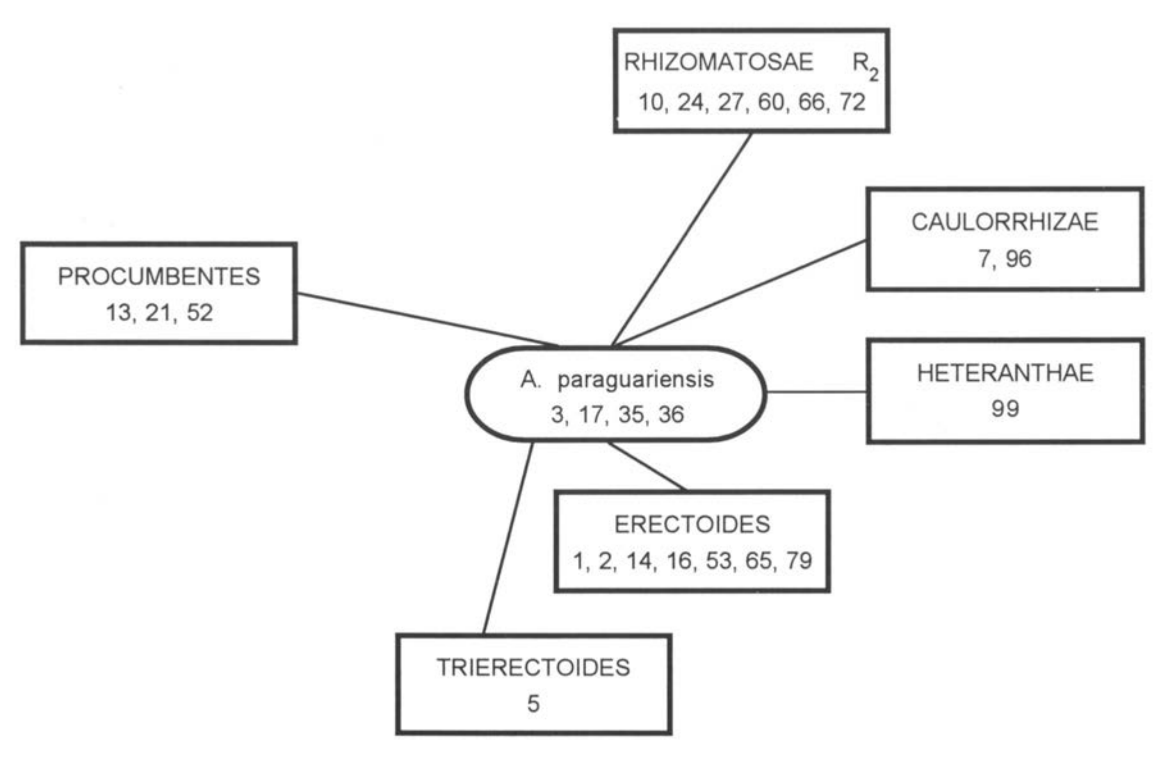


Diagram III. Crosses of *A. Rigonii* with species of other sections. The numbers indicate the parent materials used in the crosses.

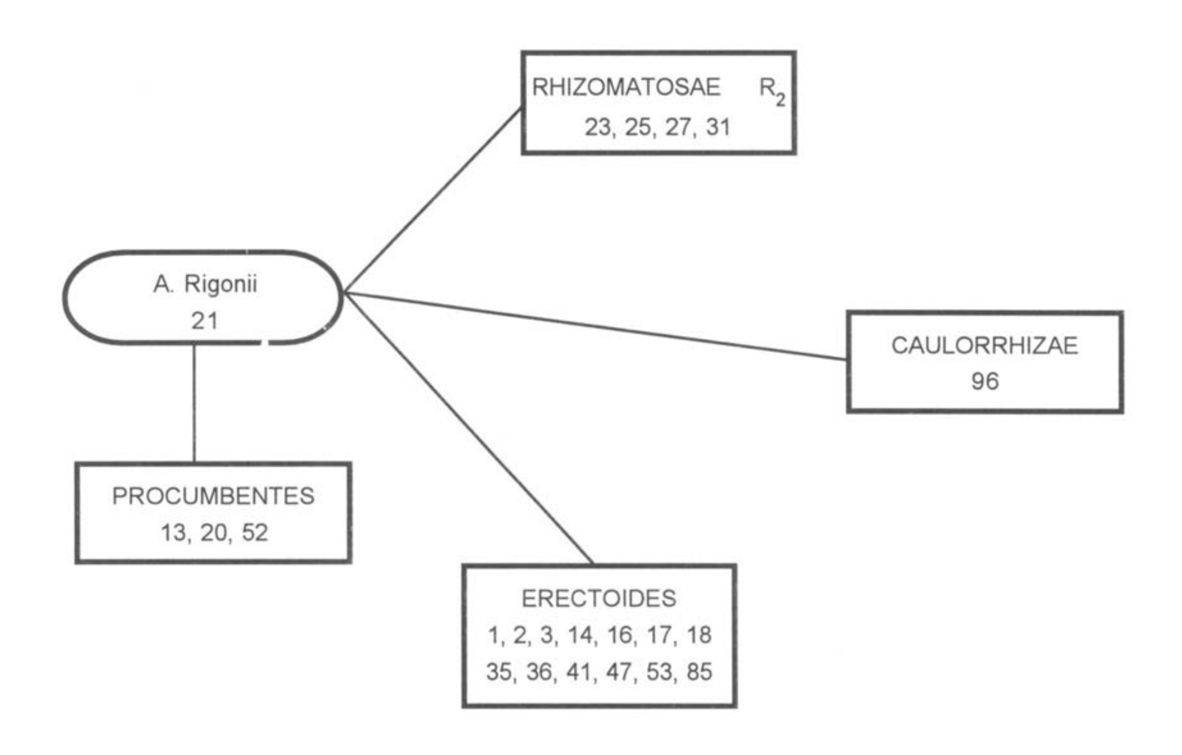
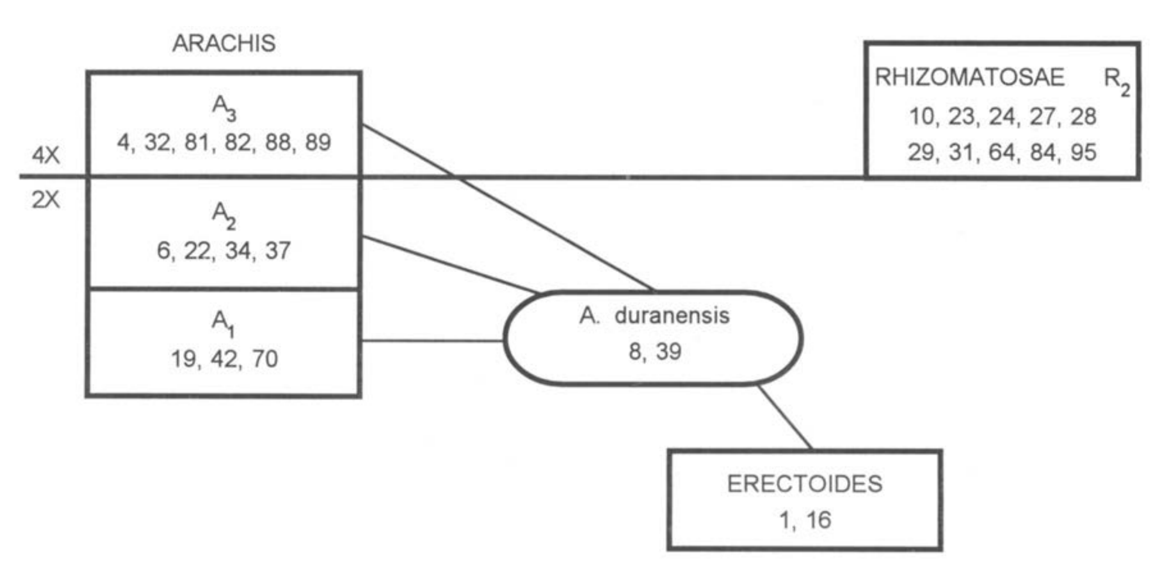


Diagram IV. Crosses of *A. duranensis* with species of other sections. The numbers indicate the parent materials used in the crosses.



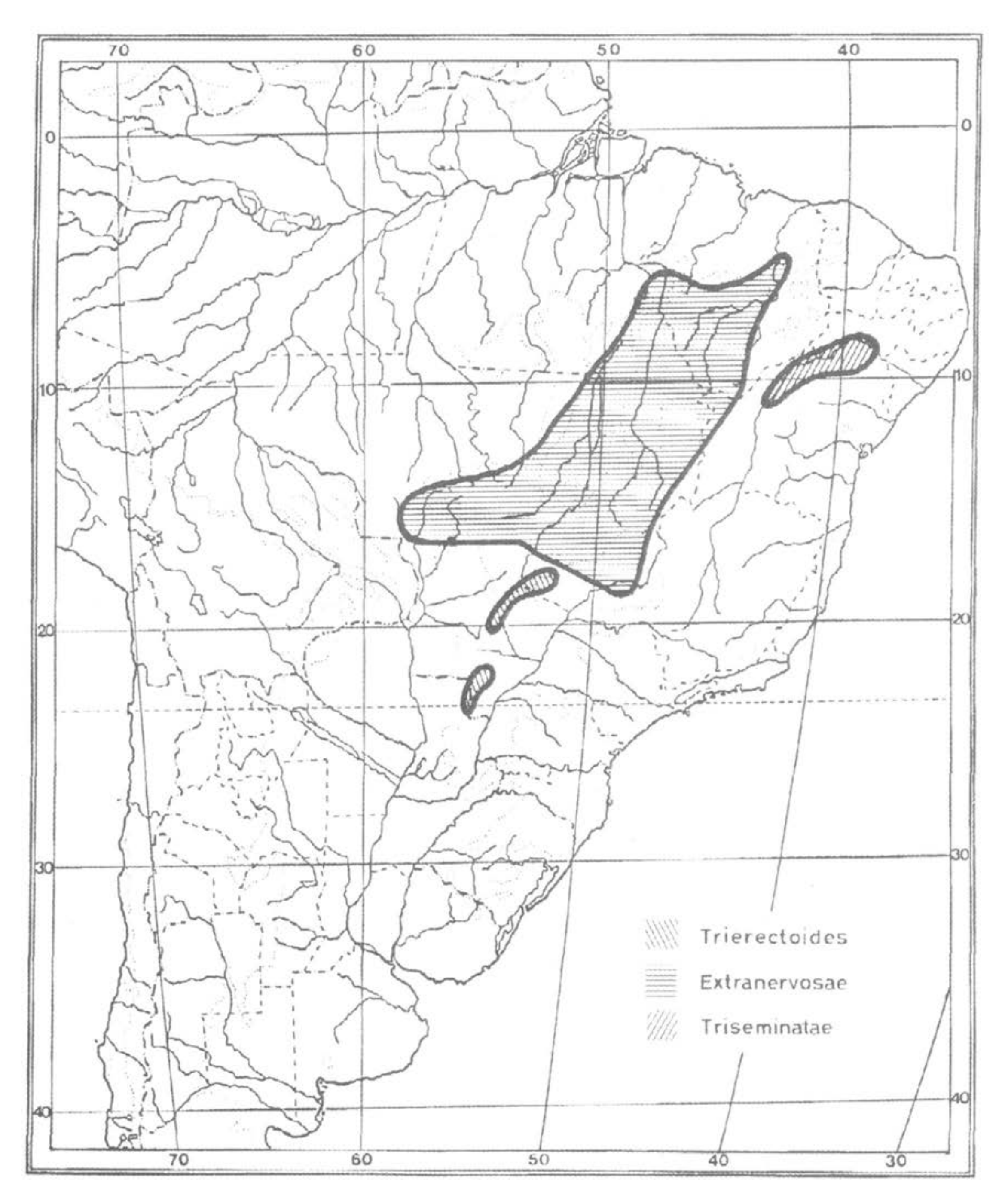


Fig. 5. Range of sections *Trierectoides, Extranervosae* and *Triseminatae*.

Meth. pl., 121, 1794.

Mandubi [Marcgr.] Adans., Fam. pl. 2: 323, 579, 1763. *nom. illeg.*

Annual, biennial or perennial plants; erect, decumbent or procumbent; sometimes rhizomatous or stoloniferous. Taproot, with branches thickened or not. Tetrafoliolate leaves, sometimes trifoliolate, generally those of the mainstem (n) somewhat larger and differently formed than those of the secondary (n+1) and tertiary (n+2) branches. Stipules partially fused to the petiole, sheathing, forming a vagination, with free portions

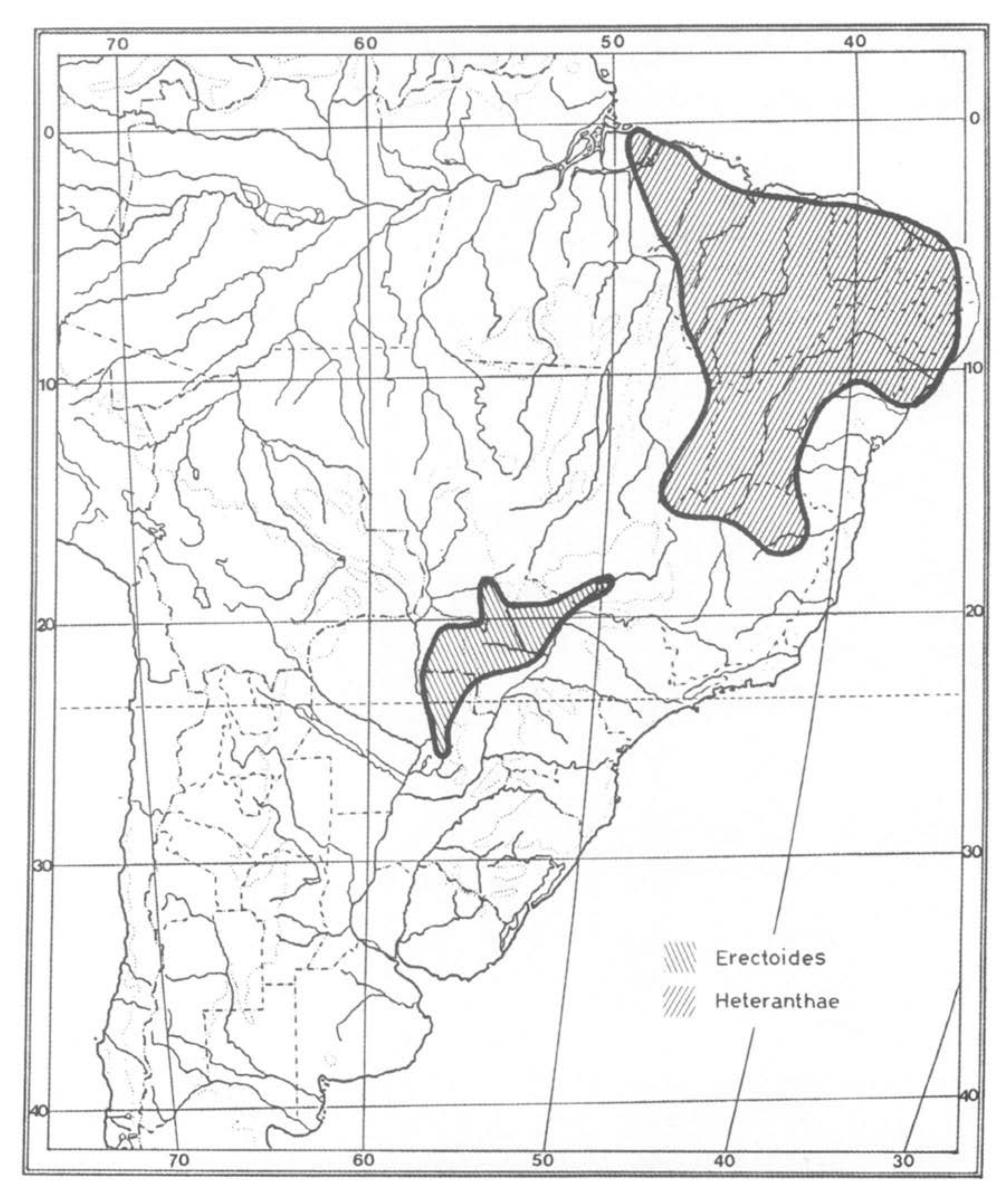


Fig. 6. Range of sections *Erectoides* and *Heteranthae*.

sharply pointed. Petiole and rachis canaliculate, channel generally interrupted at the first pair of leaflets by a transverse line of hairs. Leaflets from suborbicular to lanceolate. Indumentum constituted by long silky hairs, short adpressed hairs, cilia and emergences with conical bases ending in a long or short bristle; outstanding venation on the upper leaf surface, especially on the marginal vein. Pauciflorous axillary spikes, arranged along the length of the branches or grouped around the collar of the plant. Flowers sessile, hypanthium well developed. Bilabiate calyx, upper lobe wider and 4-

toothed, lower lobe falcate. Corolla orange or yellow. Standard with red lines on the upper, lower, or both faces. Subterranean fruit; peg short and vertical or horizontal up to more than 1 m long, sometimes with adventitious roots that may tuberize; two uniseminate articles separated by a filiform isthmus, rarely with three uniseminate articles or with a single 1- to 5-seminate article; pericarp smooth or reticulate, covered with a layer of fine hairs of variable density. Seed smooth, seed coat whitish or yellow-brown in the wild species or various colors in the cultivated peanut.

Type species: *Arachis hypogaea* L.

Key for Identifying the Sections

A. Trifoliolate leaves. Tuberiform hypocotyl. Erect plants. Flowers and fruits grouped around the collar of the plant. Pegs horizontal, superficial, very long.

I. *Trierectoides* page 34

A'. Tetrafoliolate leaves. Cylindrical hypocotyl.

B. Plants without rhizomes.

C. Fruits with 2-3 articles. Branches decumbent. Flowers and fruits along length of branches. Standard with reddish lines on both surfaces. Cotyledons with veins on upper surface very sunken.

IV. *Triseminatae* page 83

C'. Fruits with 2 articles. Cotyledons with smooth upper surface.

D. Standard with red lines on lower surface or on both surfaces. Procumbent branches.

E. Perennial plants, roots with thickenings. Standard with red lines only on the lower surface. All flowers normal, with expanded corolla.

III. *Extranervosae* page 67

E'. Annual plants, roots not thickened. Standard with red lines on the lower surface or on both surfaces. Flowers dimorphic, normal, open or very small with the corolla not extending beyond the calyx.

V. *Heteranthae* page 85

D'. Standard with red lines on upper face.

F. Plants erect or decumbent. Flowers densely grouped around the collar of the plant, those that normally produce fruit. Towards the base of the branches, only those flowers which are buried produce fruit. Roots with swollen branches (except in *A. stenophylla* and *A. paraguariensis*).

II. *Erectoides* page 40

F'. Branches procumbent. Collar of the plant without flowers; inflorescences and fruits along length of branches. In *A. appressipila* (sect. *Procumbentes*) the branches are decumbent, but the flowers are not grouped around the collar of the plant.

G. Stems with roots at the nodes.

VI. *Caulorrhizae* page 94

G'. Stems without roots at the nodes, sometimes at the underground basal internodes.

H. Pegs horizontal, very long and superficial.

VII. *Procumbentes* page 99

H'. Pegs almost vertical.

IX. *Arachis* page 123

B'. Plants rhizomatous.

VIII. *Rhizomatosae* page 113

I. Leaflets coriaceous, with the margin outstanding on both surfaces. Standard orange with red lines on both surfaces. Diploid.

Series *Prorhizomatosae* page 114

I'. Leaflets more or less soft, with the margin slightly marked. Standard orange or yellow, with red lines only on the front. Tetraploid.

Series *Rhizomatosae* page 117

I. *Sect. Trierectoides* Krapov. & W.C. Gregory *nov. sect.*

Fig. 5

Sect. Trierectoides Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973, *nomen nudum.*

Sect. Erectoides ser. Trifoliolatae Krapov. & W.C. Gregory, in W.C Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 93, 1973, *nomen nudum.*

Perennes. Hypocotylus crassus, fusiformis. Radicis ramificationes incrassatae. Stipulae marginibus basi connatis tubum internodia 1-2 includentem efficientes. Folia trifoliolata. Vexillum aurantiacum, supra lineis rubescentibus ornatum. Fructus subterraneus biarticulatus paxillo horizontali paulo profundo, pericarpio laevi.

Typus sectionis: *Arachis guaranitica* Chodat & Hassl.

Perennial plants. Hypocotyl thickened, fusiform. Root with thickened branches. Erect stems. Stipules with the margins fused, forming a tube that encloses one or two internodes. Trifoliolate leaves. Flowers clustered at the base of the plant. Hypanthium well-developed. Standard orange with reddish lines on the front. Fruit subterranean, biarticulate; peg very extended, up to 1 m long, horizontal, not deep; isthmus well-developed; articles single-seeded; pericarp smooth. 2n=20 chromosomes.

Geographic distribution. The two species of this section live in the highest places of the divide between the watersheds of the Paraguay and Paraná rivers, between 400 and 700 m above sea level. The northern limit is found in Jataí, in Goiás, at some 700 m above sea level near the divide between the Araguaia and Paranaíba rivers.

Obs. The two species of this group have various characters that are unique in the genus *Arachis*, such as trifoliolate leaves, the tuberiform hypocotyl, and the well-developed basal tube of the stipules. Because of the erect habit and the thickened root branches, this section is closely related to the section *Erectoides*, in which are found some species with basal tubes on the stipules, but much reduced and not always constant.

The section *Trierectoides* is easily differentiated from all of the other sections; it is genetically very isolated and it is quite probably the most primitive of the genus. For all of these reasons, it is much more convenient to treat this group as an independent section.

Key for distinguishing the species

A. Leaflets linear-lanceolate, rigid, up to 11.5 cm long x 0.6 cm wide.

1. *A. guaranitica*

A'. Leaflets obtuse, elliptical-lanceolate, ca. 2.5 cm long x 1 cm wide, obovate and smaller toward the base of the branches.

2. *A. tuberosa*

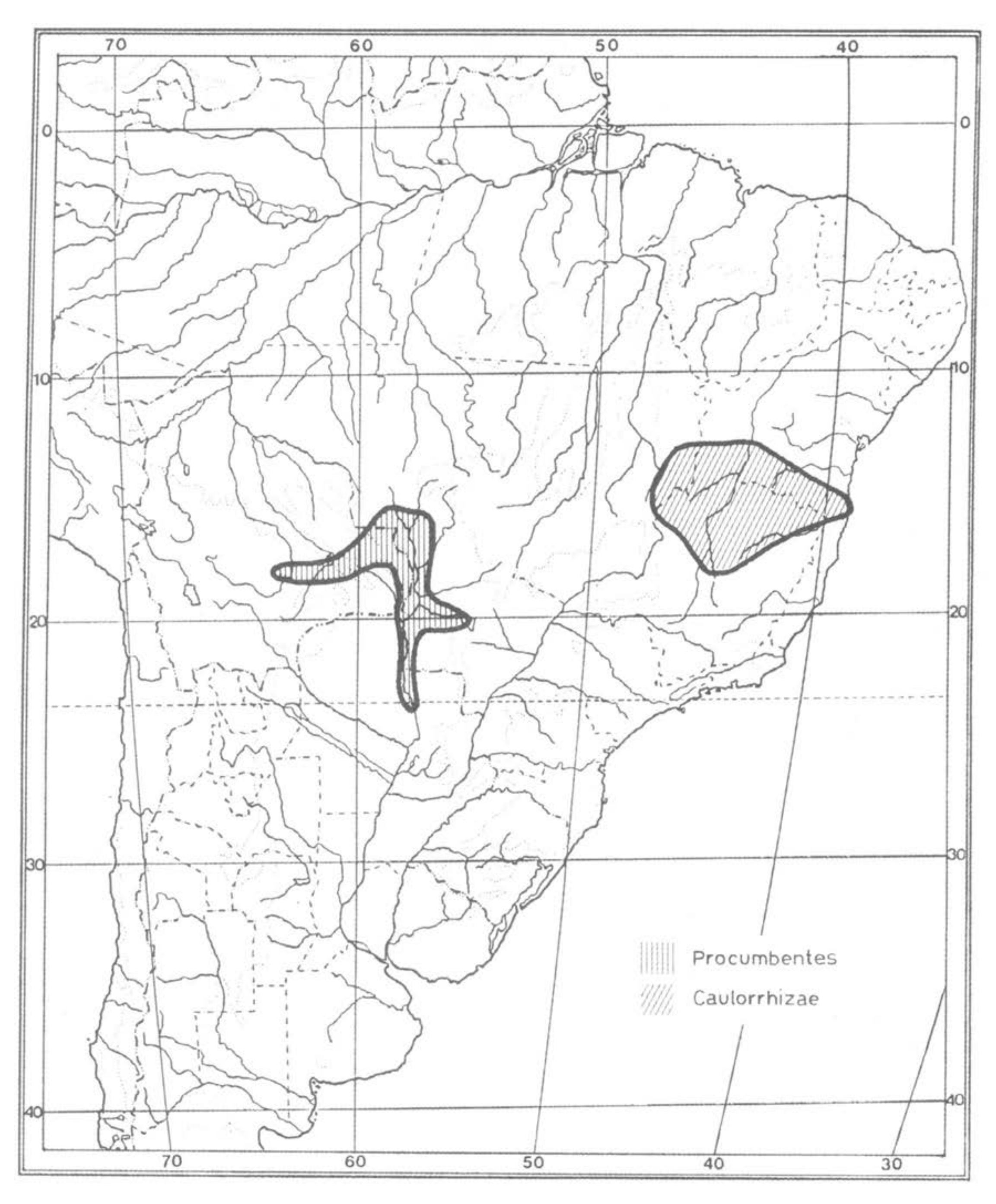


Fig. 7. Range of sections *Procumbentes* and *Caulorrhizae*.

1. *Arachis guaranitica* Chodat & Hassl.
Figs. 1,1; 10,F

Chodat & Hassler, Pl. Hassl. 2: 449-450, 1904. Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 764, 1933. Hoehne, Flora Brasílica 25(2) part. 122: 10, táb. 1, fig. 2, 1940. Hermann, Agric. Monogr. USDA 19: 7, fig. 2, 1954.

Erect perennial, 30-50 cm tall. Hypocotyl enlarged to form a tuber some 3 cm long x 1.5

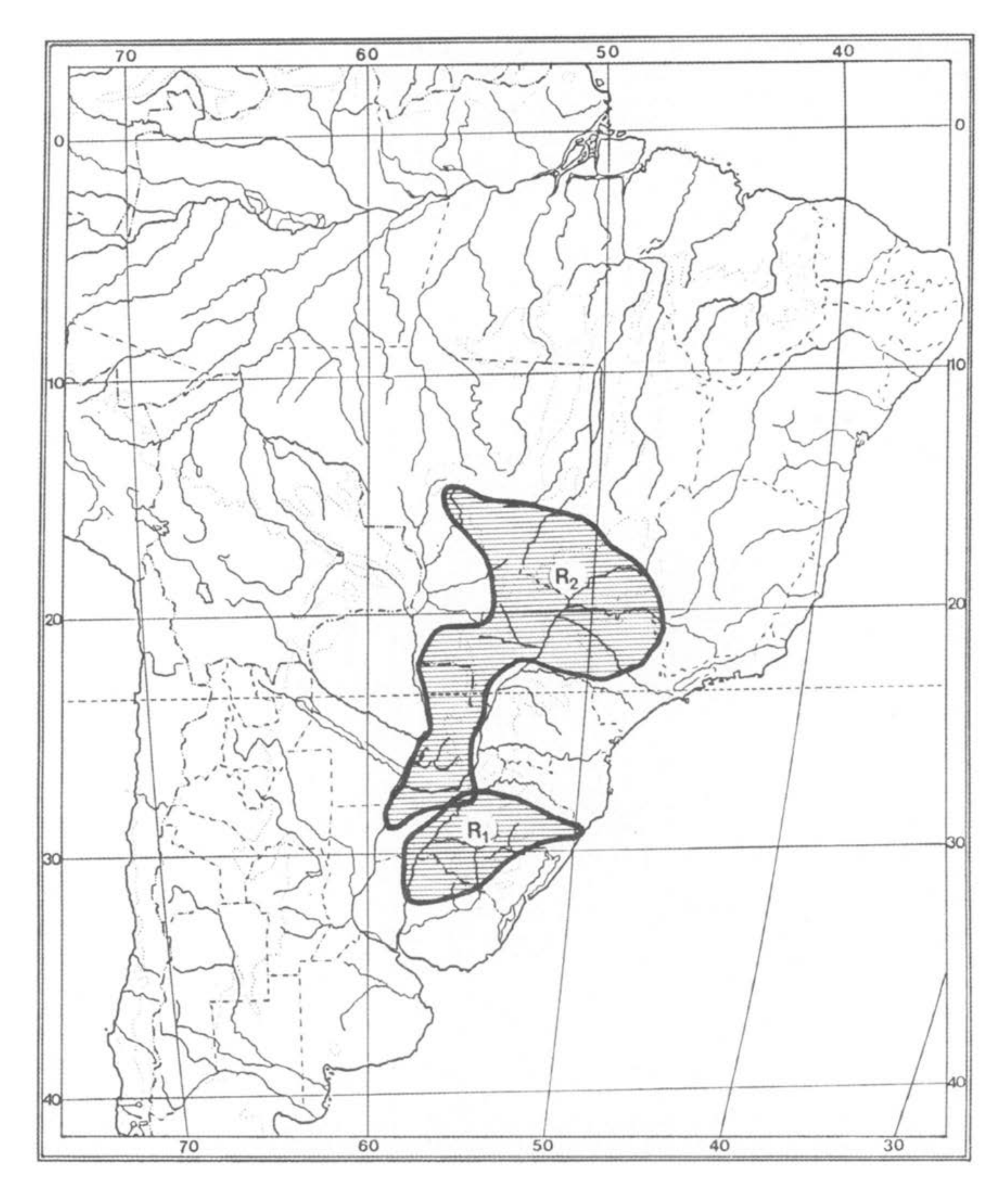


Fig. 8. Range of section *Rhizomatosae*: R1, 2n=20 ser. *Prorhizimatosae*, and R2, 2n=40 ser. *Rhizomatosae*.

cm wide, with some adventitious roots toward the base; the main root deep, without thickened branch roots. The collar bears several unbranched stems. Internodes long, completely enveloped by the stipular sheath. Leaves trifoliolate, distichous, glabrous, coriaceous. Fused portion of the stipules with fused margins forming a long tube or sheath which encloses up to two internodes; sheath closed along almost its entire length, 30-60 mm long but open at the top for 5-10 mm; free part of the stipules abruptly triangular, up to

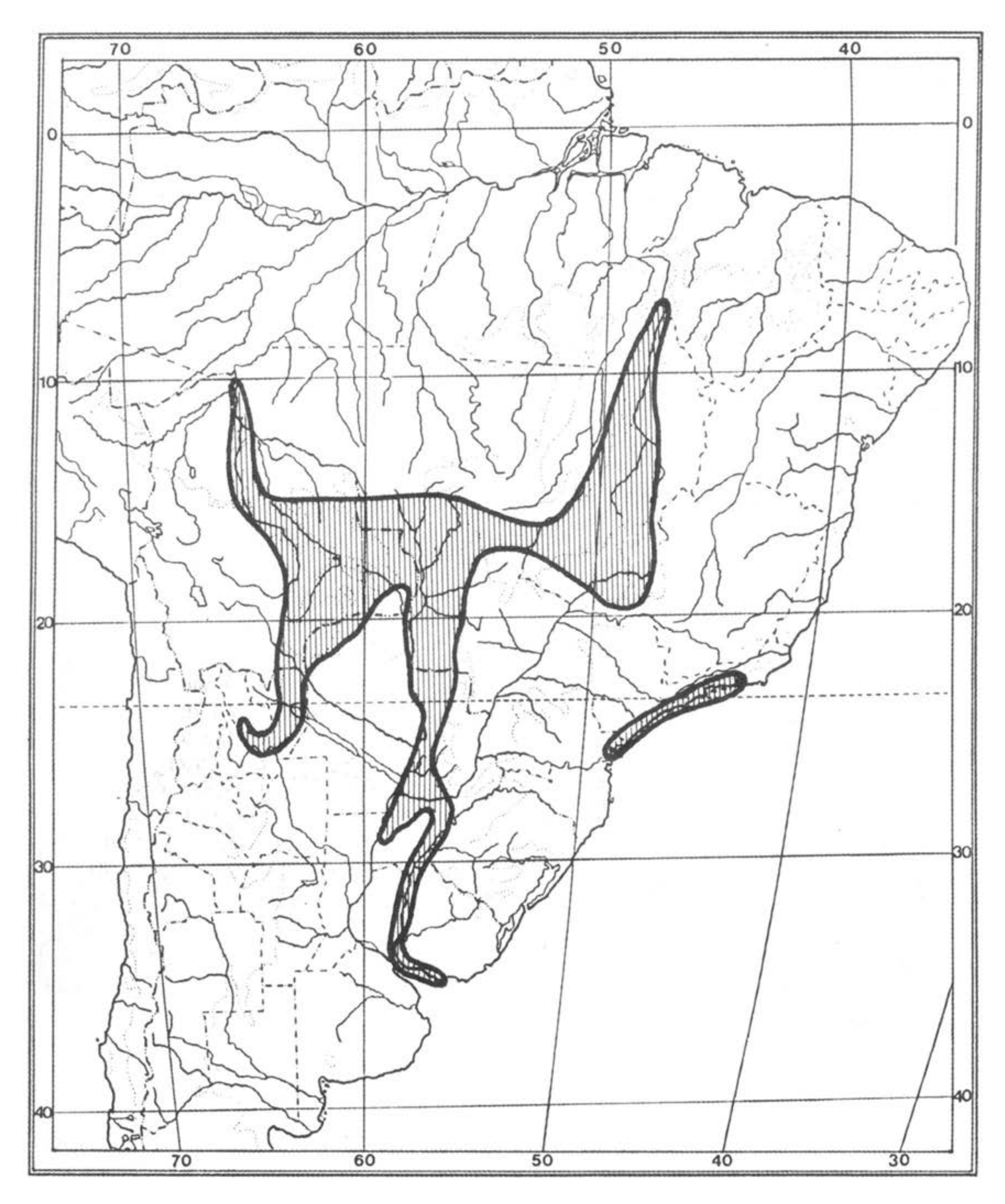


Fig. 9. Range of the wild species of section *Arachis*.

12 mm long x 2 mm wide; sheath and free portion with numerous, well-marked longitudinal veins. Petiole short, 10 mm long, canaliculate. Leaflets, more or less equal in size within a leaf, linear-lanceolate, rigid, up to 11.5 cm long x 0.6 cm wide, apex acute, sharp-pointed; upper surface smooth with prominent margin; lower surface with very prominent mid- and marginal veins and marked secondary veins. Flowers clustered at the base of the plant, surrounded by filiform bristly bracts. Hypanthium 4-8 cm long,

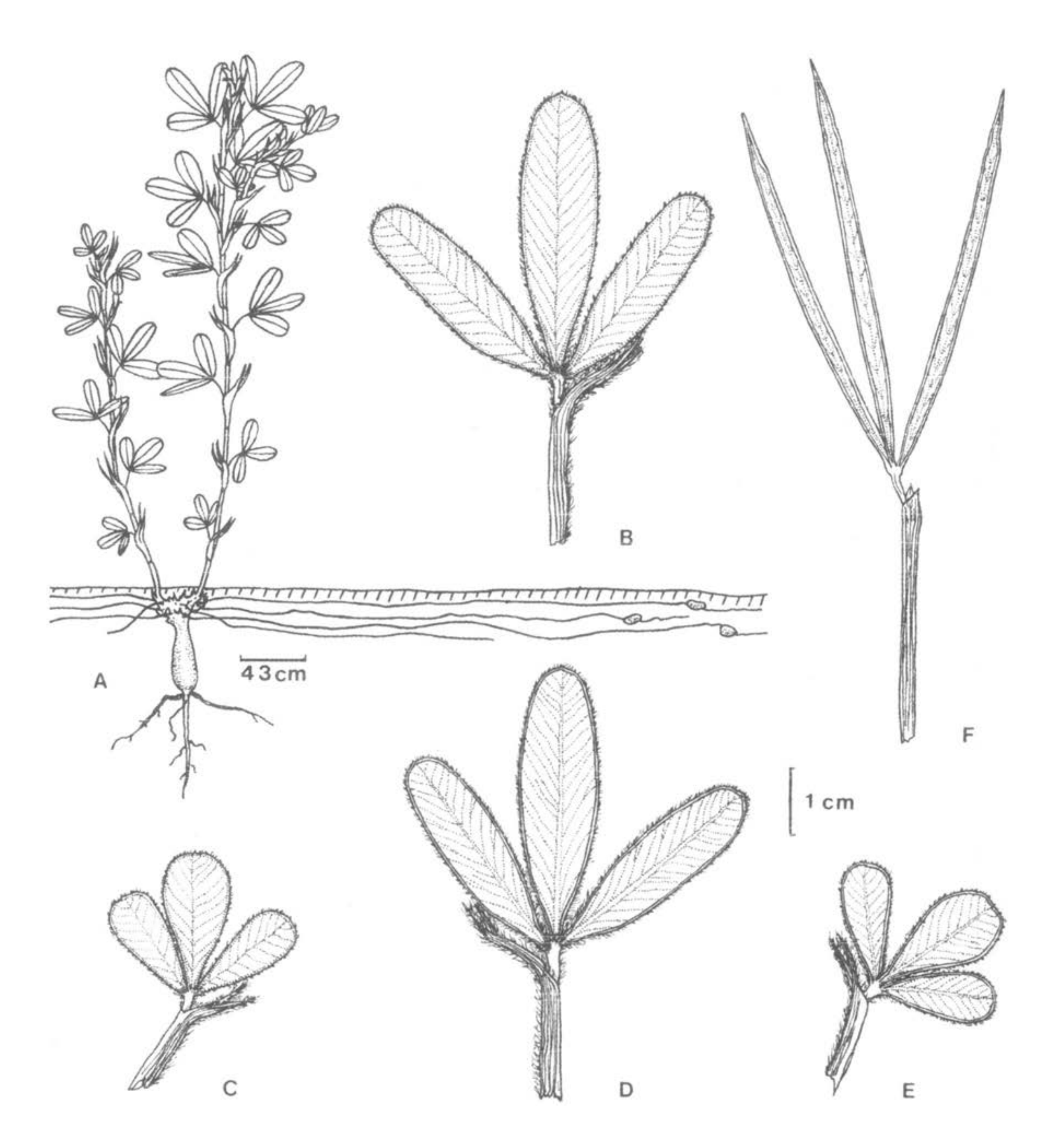


Fig. 10. *Arachis tuberosa*: A, schematic of the plant; B, leaf, upper surface; C, basal leaf, upper surface; D, leaf, lower surface; E, basal leaf, lower surface (Otero 192). *A. guaranitica*: F, leaf, lower surface (G.9701).

villous. Calyx 5-6 mm long, bilabiate, with silky hairs and bristles ca. 1 mm long. Standard orange, 10-18 mm long x 10-18 mm wide. Fruit biarticulate; peg horizontal, up to 50 cm long; isthmus well developed; articles 15-19 mm long x 7 mm wide, pericarp smooth, covered with very short hairs which retain a thin coat of soil. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Holotype: PARAGUAY. "*In campo Ipe hu, Sierra de Maracayu*, oct. *[1898] Hassler 4975*" (G!) (photo F. 27924!). Isotypes: NY!, UC!.

Additional material: BRAZIL. **Mato Grosso do Sul.** Rio Amabaí, entre Ponta Porã y Amambaí, 17-II-1959, Gregory & al. 9665 (GH, LIL, MO, NY, SI, SP, US); 14-V-1961, Gregory & al. 10568 (LIL, US); 13-VI-1968, Hammons & al. 574 (CTES); 13 km N do rio Amambaí, 24-IV-1984, Valls & al. 7694 (CEN, CTES); 8,5 km S do rio Amambaí, 24-IV-1984, Valls & al. 7700 (CEN, CTES); Dourados, km 28,5 da BR-463, 25-IV-1984, Valls & al. 7704 (CEN, CTES); entre Ponta Porã e Dourados, 25-IV-1985, Valls & al. 8728 (CEN, CTES); Antonio João (Capitan Bado), 18-II-1959, Gregory & al. 9680 (LIL, NY, US); 5 km de Amambaí, camino a Ponta Porã, 19-II-1959, Gregory & al. 9701 (CTES, GH, LIL, MO, NY, SI, SP, US); 9 km W de Caiapó, 54°55'W, 22°35'S, 19-I-1979, Krapovickas & al. 34335 (CEN, CTES).

PARAGUAY. **Amambay.** Pedro Juan Caballero, 19-X-1986, Pedersen 14681 (CTES, Herb. Pedersen).

Geographic distribution. This species grows along the Cordillera de Amambay, on the border between Paraguay and Mato Grosso do Sul (Brazil), from Ipe Jhu to Pedro Juan Caballero. The eastern part of its area extends to Dourados (MS), located some 120 km from P.J. Caballero. It prefers open areas in "campo cerrado," near rivers, where it grows in grasses and is very difficult to distinguish from the surrounding vegetation except for its characteristic flowers at the base of the plant.

Obs. *Arachis guaranitica* is the most differentiated species of the genus and cannot be confused with any other because its lanceolate leaflets make it easy to mistake for a grass. We have crossed it with *A. tuberosa*, the closest genetically, and with *A. gracilis*, *A. major* and *A. paraguariensis* ssp. *paraguariensis* of section *Erectoides*, and with *A. appressipila*, the only decumbent species of section *Procumbentes*. In all cases the pollen fertility was low, demonstrating the genetic isolation of the species.

2. *Arachis tuberosa* Bong. ex Benth.

Figs. 1,2; 10, A-E

Bentham, Trans. Linn. Soc. London 18(2): 159, 1841, "*Ad Rio Pardo. Brasiliae (v.s. comm. a Mus. Acad. Petrop. cum. fl.).*" Bentham, Fl. bras. 15(1): 88, 1859, "*Habitat in campis Camapuensibus ad Rio Pardo, Brasiliae meridionalis, Riedel.*" Hoehne, Flora Brasílica 25(2) part. 122: 9-10, táb. 1, fig. 1, 1940. Hermann, Agric. Monogr. USDA 19: 7, fig. 1, 1954. Otero, 52, 1941.

Erect perennial up to 40 cm tall. Hypocotyl a fusiform tuber, ca. 3 cm long x 1 cm thick, with adventitious roots toward the base, the taproot usually forming additional concatenated enlargements. Stems simple, unbranched, several occurring at the collar of the plant, internodes villous, usually covered by the stipules. Leaves trifoliolate. Stipules sheathing the length of the internode above or somewhat shorter, with marked longitudinal veins; the portion fused with the petiole (sheath) 18-20 mm long, completely closed, forming a tube at the basal 5 mm; free portion acute, some 10 mm long x 2 mm wide. Petiole canaliculate, short, 3 mm long. Leaflets obtuse, elliptical-lanceolate, some 25 mm long x 10 mm wide, in well-developed leaves the middle leaflet is somewhat larger (up to 40 mm long x 11 mm wide) than the laterals (up to 35 mm long x 9 mm wide), smaller leaves with obovate leaflets towards the base of the branches. Sheath and free portion of the stipules with glabrous surfaces; margins with long silky hairs. Petiole glabrous on the dorsal surface and the margins of the canal villous. Leaflets glabrous on both surfaces; upper surface smooth, shiny green; lower surface with midvein very prominent and marked secondary veins; margin prominent on the lower surface, villous and with some short, rigid bristles. Flowers clustered at the collar of the plant but also present at the basal nodes of the branches. Hypanthium filiform, pilose, 4-7 cm long. Calyx bilabiate, villous, wide lobe 7 mm long, narrow lobe falcate, 8 mm long. Standard 10-16 mm long, orange. Fruit biarticulate, peg horizontal, sinuous, elongated; isthmus ca. 8 cm long; articles 10-15 mm long x 7 mm wide; pericarp smooth, fragile.

Holotype: BRAZIL. Mato Grosso. Rio Pardo, X-1826, Riedel 605 (K!). Isotype: P!.

Selected additional material: BRAZIL. **Goiás**. Jataí, 18-XII-1948, Macedo 1535 (LIL, NY); Balsamo, 1-XI-1950, Macedo 2693 (US); 10 km W de Jataí, 16-III-1959, Gregory & al. 9942 (GH, LIL, MO, NY, SI, US); id., Valls & al. 6310 (CEN); Serra do Caiapó, 30 km N de Jataí, 24-X-1964, Irwin & al. 7281 (K, NY, RB, US); 10 km N of Jataí, Eiten & al. 9340-B (UB); 10 km N de Jataí, 14-X-1968, Fonseca & al. 1551 (UB); Un km W de Jataí, Valls & al. 6305 (CEN); km 193,2 da BR-364, 10-IV-1984, Valls & al. 7545 (CEN, CTES); 10,2 km NW de Jataí, BR-364, 11-IV-1984, Valls & al. 7547 (CEN, CTES). **Mato Grosso do Sul**. Campo Grande, Fazenda Imbirussú, 31-I-1933, Otero 192 (RIZ, SP); id., Otero 452 (K, SP); id., 25-II-1959, Gregory & al. 9818 (GH, LIL, MO, NY, SI, US); alrededores de Campo Grande, camino a Sidrolandia, 10-II-1979, Krapovickas & al. 34497 (CEN, CTES, F, G, MO, SP, UC, US); 54 km N de Campo Grande, 5-III-1959, Gregory & al. 9837 (GH, LIL, MO, NY, SI, SP, US); Campo Grande, Imburussú, 16-IV-1984, Valls & al. 7607 (CEN, CTES); Campo Grande, bairro Batistão, 4-IV-1986, Valls & al. 9878 (CEN, CTES).

Common name. "amendoim de túberas" (Otero 1952: 178).

Geographic distribution. Grows in Mato Grosso do Sul (Brazil), in the hills of Maracaju along the divide between the watersheds of the Paraguay and Paraná rivers, from Campo Grande to the headwaters of the Pardo River. It appears in the area of Jataí in the south of Goiás. In the "cerrado," it prefers shady places under trees.

Obs. With some frequency, the plants have small basal leaves with four leaflets.

The only crosses obtained with this species have been with *A. guaranitica* of the same section and with *A. gracilis* and *A. major* of section *Erectoides*. In all cases the pollen fertility of the hybrids is very low, except in the case of *A. gracilis* in which the pollen fertility fluctuates between 11.8 and 18.7%.

II. *Sect. Erectoides* Krapov. & W.C. Gregory *nov. sect.*

Fig. 6

Sect. Tetraerectoides Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973, *nomen nudum*.
Sect. Erectoides ser. Tetrafoliolatae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 93, 1973, *nomen nudum*.

Perennes. Radicis ramificationes saepe incrassatae. Rami erecti vel decumbentes. Folia quadrifoliolata. Vexillum aurantiacum, supra lineis rubescentibus ornatum. Fructus subterraneus biarticulatus paxillo horizontali, valde elongato, paulo profundo, pericarpio laevi.

Typus sectionis: *Arachis Benthamii* Handro

Perennial plants. Root frequently has thickened branches. Branches erect or decumbent. Leaves tetrafoliolate. Flowers clustered at the base of the plant. Hypanthium well-developed. Standard orange with reddish lines on the front. Fruit subterranean, biarticulate; peg very long, horizontal, not deep; isthmus well-developed; articles single-seeded; pericarp smooth. 2n=20 chromosomes.

Geographic distribution. Two groups can be established according to the presence of roots with thickened branches or without them. The first, constituted by the majority of species from this section, is characteristic of the "cerrado" with red soil which surrounds the Mato Grosso Pantanal and is almost exclusive to Mato Grosso do Sul, except for *A. brevipetiolata* from the extreme south of Goiás on the Paranaíba River, *A. cryptopotamica* which barely extends beyond the northern boundary of Mato Grosso do Sul, and *A. major* which extends as far as the department of Amambay, in Paraguay. It lives on both sides of the divide between the watersheds of the Paraguay and Paraná rivers and barely penetrates into the Pantanal.

The second group, constituted by *A. stenophylla* and *A. paraguariensis*, lives in the SW extreme of the section's range. The

taxon of widest distribution is *A. paraguariensis* ssp. *paraguariensis*, whose range extends from the north of the Sierra de Bodoquena, in Mato Grosso do Sul, to close to Paraguarí, in Paraguay. The other taxa live within this range, along the border between Mato Grosso do Sul and Paraguay, between Bela Vista and Porto Murtinho. They prefer to live outside the "cerrado," in soils of light-colored sand and, while they may be found near watercourses, they prefer higher places, away from periodic flooding.

Obs. The second group, that includes *A. paraguariensis*, perhaps deserves to be considered as an independent section, given the low genetic affinity exhibited in crosses with the rest of the species of the section *Erectoides*. Moreover, it shows some suggestive differences, such as the lack of thickened branches on the roots, and the flowers, although more frequent at the base of the plant, do not form such a dense cluster as in the other species, and the fruits have larger articles.

Key for distinguishing the species

A. Roots with thickened branches. Branches straight, not undulate.

B. Leaflets suborbicular, oval or oval-lanceolate, ratio length/width less than 4:1 (may reach a maximum of 4.2:1, in *A. douradiana*).

C. Distal leaflets obovate to suborbicular and the proximal leaflets elliptical, small, 7-12 mm long x 4-9 mm wide, upper surface with very short hairs, lower surface villous, with bristles. Stipules villous, without bristles.

3. *A. Martii*

C'. Leaflets greater than 20 mm long.

D. Petiole short, 2-4 mm long. Stipules and petiole villous, without bristles. Leaflets with both surfaces villous. Seed ellipsoid, 11 mm long x 3.5 mm wide.

4. *A. brevipetiolata*

D'. Petiole greater than 5 mm long. Seed thicker, 5-7 mm wide.

E. Leaflets with upper surface glabrous and lower surface with adpressed hairs.

F. Leaflets with the margin very marked on both surfaces (when dry), noticeably ciliate. Leaflets generally obovate and frequently with bristles on the lower surface. Stipules and petiole without bristles. Petiole 8-15 (20) mm long.

5. *A. Oteroi*

F'. Leaflets with the margin somewhat marked only on the lower surface, commonly elliptical.

G. Stipules and petiole with bristles. Petiole 15-28 mm long.

6. *A. Hatschbachii*

G'. Stipules and petiole without bristles. Petiole 30-38 mm long.

7. *A. cryptopotamica*

E'. Leaflets with short hairs on the entire upper surface, and sometimes only toward the base and on the midvein.

H. Large plants, highly branched, n+3 branches present. Leaflets commonly without bristles on the lower surface.

8. *A. major*

H'. Smaller plants, little branched, secondary branches erect, very slightly arched at the base, the branching ends with short n+2 branches, not longer than 10 cm.

J. Leaflets with length/width ratio 1.5-2.5:1 (rarely 3), frequently with bristles on the lower surface, ciliate margin, very rarely with an occasional bristle. Petiole 10-30 mm long.

9. *A. Benthamii*

J'. Leaflets with length/width ratio 2.3-4.2:1, without bristles. Petiole commonly 6 mm long, rarely up to 9 mm.

10. *A. douradiana*

B'. Leaflets elongatedly elliptical, ovate-lanceolate, length/width ratio 3-8:1 (there is usually a lesser ratio toward the base of the branches, but always, on the same plant, the leaflets towards the ends of the branches present a ratio greater than 5:1), generally with bristles on the lower surface.

K. Petiole and stipules with bristles, stipules with the margins fused forming a very short tube. Length/width ratio of the leaflets 4-8:1. Petiole 10-25 mm long.

11. *A. gracilis*

K'. Petiole and stipules without bristles.

L. Tube at the base of the stipules up to 9 mm long. Leaves spaced out, internodes up to 50 mm long, petiole 15-35 mm long. Length/width 3-7:1.

12. *A. Hermannii*

L'. Tube at the base of the stipules up to 4 mm long. Leaves grouped towards the apex of the branches, internodes 10-15 mm long. Petiole commonly 10-15 mm long (rarely up to 30 mm).

13. *A. Archeri*

A'. Taproot, with slender ramifications, without thickenings. Stems undulate or somewhat twisted. Margin of the leaflets marked.

M. Leaflets linear-lanceolate, less than 10 mm wide, length/width ratio 7-12:1.

14. *A. stenophylla*

M'. Leaflets more than 10 mm wide, length/width ratio less than 5:1.

N. Length/width ratio of the distal pair of leaflets 2.6-3.4:1 and of the proximal pair 3.3-4.3:1. Margin and veins very marked on the lower surface.

15a. *A. paraguariensis* ssp. *paraguariensis*

N'. Leaflets wider, with veins and margin not so outstanding; length/width ratio of the distal pair 2-3:1 and of the proximal pair 2.5-3.5:1.

15b. *A. paraguariensis* ssp. *capibarensis*

3. *Arachis Martii* Handro

Handro, Arq. Bot. Estado São Paulo 3: 179-180, táb. 46, 1958.

A. helodes Mart. ex Hoehne, Flora Brasílica 25(2) part. 122: 13, táb. 7, 1940, *nomen nudum pro parte* (Otero 174), *excl. specimina ex Cuiabá.*

A. pusilla auct. non Benth., Otero, Serv. Inform. Agric. Min. Agric.: 37, 1941, photograph of specimen Otero 174.

Perennial plant, sub-erect, 20-30 cm tall. Taproot, with enlarged branches. Crown thick, with remains of inflorescences. Stems decumbent, 10-30 cm long, internodes hirsute, covered by the stipules. Leaves tetrafoliolate. Stipules with the sheath 4-5 mm long, striated, margins contiguous; the free portion 8-10 mm long, linear-lanceolate. Petiole canaliculate, 8-10 mm long. Rachis canaliculate, 2.5-3.5 mm long. Leaflets subsessile, 7-12 mm long x 4-9

mm wide; the two apical leaflets obovate to suborbicular, the two basal elliptical. Stipules villous, hairs caducous, those of the margins more persistent. Petiole, rachis and pulvinus densely villous. Upper surface of the leaflets with short, sparse, more or less erect hairs; the lower surface villous, some bristles may be present mainly on the secondary veins, midvein hirsute; margin ciliate. Spikes few-flowered, short, clustered principally at the base of the plant but also occurring along the branches. Hypanthium filiform, villous, up to 5 cm long. Calyx villous, 5-6 mm long. Standard ca. 12 mm long x 14 mm wide, orange with a yellow base. Fruits biarticulate, clustered at the collar of the plant and along those stems in contact with the soil; peg horizontal, some 25 cm long, isthmus 2 cm long; articles 8-10 mm long x 4-5 mm wide, pericarp smooth.

Holotype: BRAZIL. Mato Grosso do Sul. Campo Grande, Fazenda Imbirussú, 30-I-1933, Otero 174 (SP!). Isotype: RIZ!.

Additional material: BRAZIL. **Mato Grosso do Sul**. Campo Grande, Imbirussú, 8-VI-1968, Hammons & al. 525 (CTES) and 526 (CTES, SI).

Geographic distribution. Known only from the type locality. We collected it in places with deep red soil where the arboreal vegetation had been recently removed. Currently, with its demographic growth, Imbirussú has been transformed into a suburb of Campo Grande, and consequently it is presumable that we are witnessing a species in the process of extinction.

Obs. Artificial hybrids were obtained with *A. gracilis* and *A. stenophylla,* of the same section, and with *A. Rigonii* and *A. appressipila* of the section *Procumbentes.* In almost all cases the pollen fertility was very low, less than 1%, except with *A. gracilis* in which the hybrid showed 6% pollen fertility. It is worth noting that while *A. Martii* has suborbiculate leaflets, it crosses with the species with the narrowest leaflets of the section *Erectoides*.

4. *Arachis brevipetiolata* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,4; 11,D-E

Herba perennis, erecta. Radicis ramificationes tenerrimae, partes incrassatas 5-10 mm longas, subglobosas vel cylindricas concatenatas gerentes. Caulis angulosus, villosus. Stipulae marginibus basi connatis tubum usque ad 9 mm longum x 1.5-2 mm latum efficientes, villosae. Petiolus 2-4 mm longus. Foliola elliptica vel obovatiora epiphyllo villoso usque lanato, hypophyllo dense adpresso-villoso. Fructus biarticulatus paxillo horizontali ca. 20 cm longo, articulis 13 mm longis x 6 mm latis, pericarpio laevi.

Holotype: BRAZIL. Goiás. Itumbiara, borde del camino a Goiania, 5-IV-1961, Gregory, Krapovickas & Pietrarelli 10138 (LIL). Isotypes: CTES, GH, MO, NY, US.

Perennial plant, erect, without rhizomes, villous, reddish-brown. Taproot, with slender branches and with subspherical or cylindrical concatenate enlargements 5-10 mm long. Stems erect, up to 40 cm long, wavy toward the apex; internodes usually short but toward the base of the plant may reach 55 mm in length, somewhat angular, very hairy. Leaves tetrafoliolate. Stipules with the fused base 7-9 mm long x 1.5-2 mm wide and the free portion 11-14 mm long x 1 mm wide, rigid, with prominent veins; the stipular sheath somewhat closed, forming a short tube at the base, or open; densely villous on the fused portion with long, brown hairs; on the free portion the external surface is villous but the epidermis is visible. Petiole 2-4 mm long, villous. Rachis 4-5 mm long, villous. Leaflets elliptical or somewhat obovate, obtuse to moderately acute, upper leaf surface villous to woolly, with hairs more or less curly but epidermis visible; lower surface densely villous, hairs adpressed. Apical pair of leaflets 24-25 mm long x 9-10 mm wide, basal pair of leaflets 21-25 mm long x 9-10 mm wide; midvein prominent beneath, margin and secondary veins slightly marked. Flowers clustered at the base of the plant. Fruit subterranean; pegs

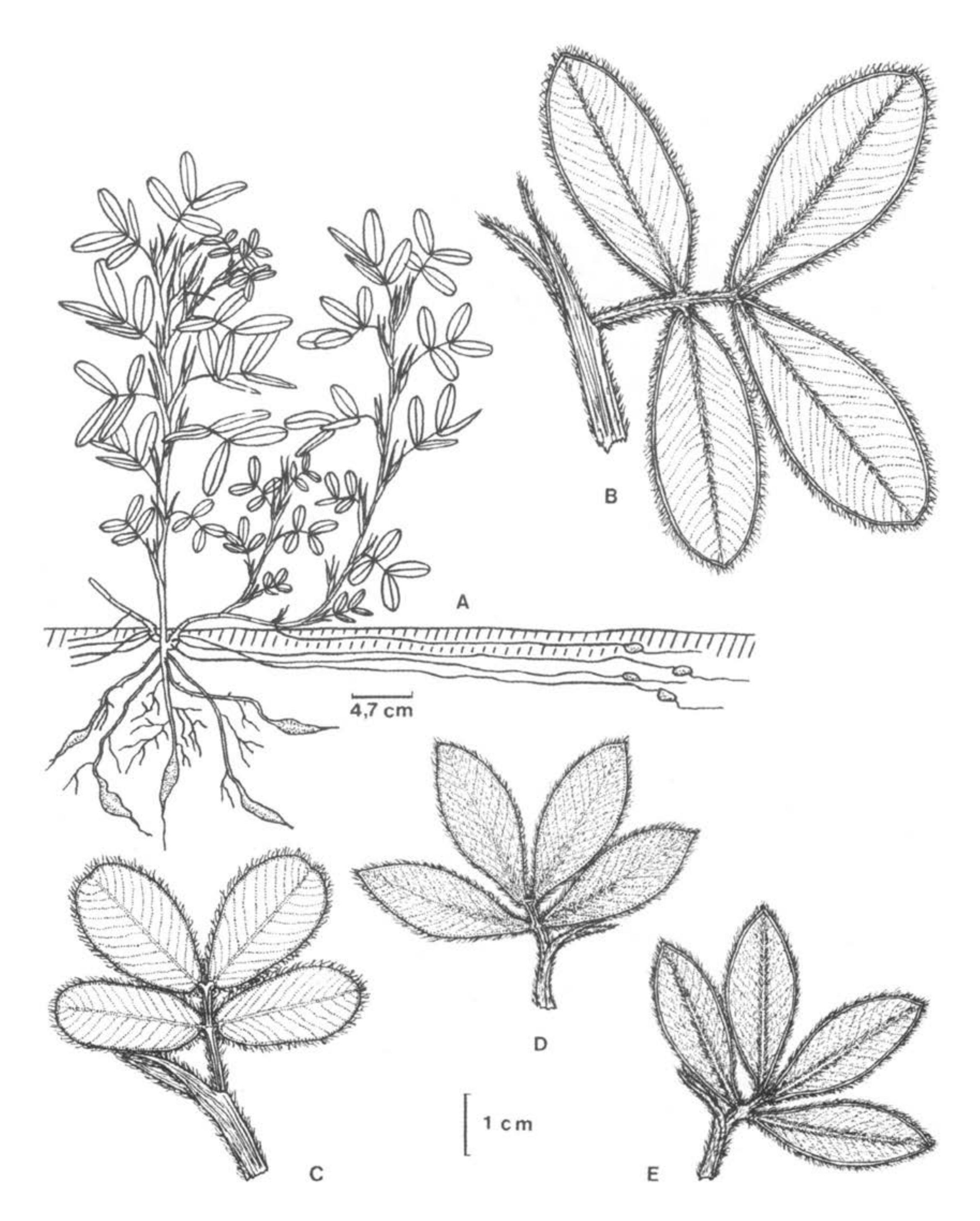


Fig. 11. *Arachis Oteroi*: A, schematic of the plant; B, leaf, lower surface; C, leaf, upper surface (G.9790). *A. brevipetiolata*: D, leaf, upper surface; E, leaf, lower surface (G.10138).

horizontal, ca. 20 cm long, growing ca. 2 cm deep; articles 13 mm long x 6 mm wide, epicarp smooth; seed 11 mm long x 3.5 mm wide.

Geographic distribution. Known only from the type locality. This is the species in section *Erectoides* that grows in the northeasternmost edge of its range. It was collected near the

Paranaiba River on an open trail in a forested environment. Today the place has been totally changed by the extensive cultivation of sugar cane and by the increasing urbanization of the area.

Obs. This species is close to *A. Benthamii* from which it may be separated by its narrow, ellipsoid seed, its very short petiole, its woolly upper leaflet surface, and by the concatenate thickenings of the roots.

5. *Arachis Oteroi* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,5; 11, A-C

A. marginata auct. non Gardner, Hoehne, Flora Brasílica 25(2): 16, p.p. táb. 10, 1940. Mendes, Bragantia 7: 262, 1947, 2n=20. Handro, Arq. Bot. Estado São Paulo 3(4): 177, táb. 44, 1958.

A. Oteroi Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 101, 1973, *nomen nudum* (Hammons & al. 521, 522, 523 and 524).

Herba perennis. Radix fusiformis ramificationibus incrassatis. Caule erecti, villosi. Stipulae basi villosae marginibus dense ciliatae. Foliola oblonga usque obovata, rigida, coriacea, supra subtusque insigniter marginata, epiphyllo glabro, hypophyllo pilis adpressis setulis sparsis saepe immixtis vestito, nervo medio hirsuto, margine ciliis longis, densis, patentibus ornate. Hypanthium 3-8.5 cm longum, villosum. Calyx 6 mm longus, villosus. Vexillum 11-13 mm longum x 14-16 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali usque ad 60 cm longo, isthmo usque ad 10 cm longo, articulo proximali 10-13 mm longo x 5-6 mm lato, distali usque ad 21 mm longo x 7.5 mm lato apice recurvo, pericario laevi usque leviter reticulato.

Holotype: BRAZIL. Mato Grosso do Sul. Campo Grande, Fazenda Imbirussú, 30-I-1933, Otero 194 (SP 30163), (Handro, 1958, táb. 44, sub. *A. marginata*). Isotypes: RIZ, CTES.

Erect perennial. Main root fusiform, deep, often with constrictions, branches with fusiform enlargements. Basal part of the stems beneath the soil with numerous subterranean flowers and pegs. Stems erect, 20-30 cm, up to 55 cm long, little branched, frequently arching toward the soil; internodes furrowed, villous, with long silky hairs, covered by the stipules. Leaves tetrafoliolate. In well-developed leaves the fused portion of the stipules reaches 20 mm in length with margins 4 mm wide, the free portion up to 30 mm in length. Petiole usually 8-15 mm long, up to 20 mm. Rachis some 10 mm long. Leaflets oblong to obovate, rigid, coriaceous; apex obtuse, mucronulate; thick margin, very prominent on both surfaces, especially when dry; the apical pair some 55 mm long x 21 mm wide, the basal pair somewhat smaller, 50 mm long x 16 mm wide. The fused base of the stipules villous, the free portion acute, rigid, subglabrous, margin densely ciliate, hairs long. Petiole villous on the back, the margin of the canal strongly thickened, ciliate. Pulvinus densely villous. Upper surface of the leaflets glabrous, the lower surface with weak adpressed hairs and frequently with long scattered bristles, midvein hirsute, margin with long, dense, spreading cilia. Spikes few-flowered, very short, occurring along the branches or densely grouped around the collar of the plant where their axis may be up to 10-20 mm long and 5-flowered. Flowers in the axil of two bracts, 10 mm long, one entire and single-veined, and the other bifid and two-veined. Hypanthium 30-85 mm long, villous, hairs copper-colored. Calyx 6 mm long, villous. Standard 11-13 mm long x 14-16 mm wide, orange toward the margin and yellow at the base; wings 7-10 mm long. Ovary sessile, biovular. Fruit subterranean, biarticulate; peg up to 60 cm long somewhat sinuous, isthmus up to 10 cm long; basal article 10-13 mm long x 5-6 mm wide, apical article somewhat larger, up to 21 mm long x 7.5 mm wide, beak developed; pericarp smooth or lightly reticulate, covered with small hairs that retain particles of soil. Seeds cylindrical, filling the cavity of the articles. 2n=20 chromosomes (Mendes 1947, sub *A. marginata*, no. 82).

Additional material: BRAZIL. **Mato Grosso do Sul.** *In locis subhumidis campi Camapuan*, Riedel

604, Herb. Acad. Petrop. 418 (K); Ribas do Rio Pardo, 3-III-1959, Gregory & al. 9828 (GH, LIL, MO, NY, US); 38 km W de Ribas do Rio Pardo, 25-I-1979, Krapovickas & al. 34409 (CTES); Ribas do Rio Pardo, Valls & al. 11768 (CEN); Campo Grande aeropuerto, 22-II-1959, Gregory & al. 9735 (GH, LIL, MO, NY, SI, US); id., 9-V-1968, Hammons & al. 548 (CTES, SI); Campo Grande, Faz. Imbirussú, 27-V-1939, Otero & al. 453 (SP); 25-II-1959, Gregory & al. 9819 (GH, LIL, MO, NY, US); id., 8-VI-1968, Hammons & al. 524 (CTES, US); Campo Grande 1-IX-1936, Archer & al. (SP 36470); Campo Grande, Faz. das Moças, 9-IX-1936, Archer & al. (Hoehne, 1940, tab. 10) (SP 36473); Campo Grande, Estaca-Jaraguary, 10-IX-1936, Archer & al. 151 (SP 36474); Campo Grande, 5-VIII-1936 (Mendes, 1947, 2n=20), Hoehne & al. (SP 35773); Pedro Celestino, 57 km W de Campo Grande, 9-VI-1968, Hammons & al. 549 (CTES); 37 km N de Campo Grande, 5-III-1959, Gregory & al. 9832 (CTES, GH, LIL, MO, NY, SI, SP, US); Congonha, 102 km N de Campo Grande, 6-III-1959, Gregory & al. 9853 (LIL, SI, SP); 135 km N de Campo Grande, ruta a Cuiabá, 6-III-1959, Gregory & al. 9855 (GH, LIL, MO, NY, US); 163 km N de Campo Grande, 6-III-1959, Gregory & al. 9858 (CTES, GH, LIL, MO, NY, SI, SP, US); 3 km N de Bataguaçú, camino a Xavantina, 26-II-1959, Gregory & al. 9747 (GH, LIL, MO, NY, SI, US); Faz. 3 Barras, entre Xavantina y Porto Ueré (río Pardo), 26-II-1959, Gregory & al. 9763 (GH, LIL, MO, NY, US); Faz. Pouso Alto, 30 km SE de Xavantina, 26-II-1959, Gregory & al. 9765 (GH, LIL, MO, NY, SI, US); id., Gregory & al. 9766 (GH, LIL, MO, NY, SI, SP, US); entre Pouso Alto y Xavantina, 27-II-1959, Gregory & al. 9770 (LIL, US); 42 km W de Porto 15 Novembro, 7-VI-1968, Hammons & al. 521 (CTES, US); 50 km W de Bataguaçú, 28-II-1959, Gregory & al. 9786 (LIL, US); 10-15 km W de Douradinho, 11-V-1961, Gregory & al. 10541 (CTES, LIL, MO, NY, US); 135 km W de Bataguaçú, 28-II-1959, Gregory & al. 9790 (CEN, CTES, G, GH, K, LIL, MO, NY, SI, SP, US); 45 km W de Douradinho, 11-V-1961, Gregory & al. 10543 (LIL); 150 km W de Bataguaçú, 28-II-1959, Gregory & al. 9792 (GH, LIL, MO, NY, US); 40 km E de Entroncamento (mun. Rio Brilhante), 11-V-1961, Gregory & al. 10545 (LIL, NY, US); 25 km E de Entroncamento, 1-III-1959, Gregory & al. 9793 (LIL, MO, NY, US); 16 km E de Entroncamento, 1-III-1959, Gregory & al. 9810 (GH, LIL, MO, NY, SI, US); 9 km E de Entroncamento, 11-V-1961, Gregory & al. 10549 (LIL, US); Tres Lagoas, 3-XII-1943, Baldwin Jr. 3139 (US); Tres Lagoas, Valls & al. 11746 (CEN). Mun. Campo Grande: terrenos baldios junto ao antigo colegio Batista Matogrossense do Bairro Batistão, 4-IV-1986, Valls & al. 9875 (CEN, CTES); antigo campo de esportes do Colegio Batista Matogrossense no bairro Imburussu, 17-IV-1984, Valls & al. 7618 (CEN, CTES); cerca de 12 km ao longo da BR-163 a partir do perimetro urbano de Campo Grande, 9-IV-1986, Valls & al. 9937 (CEN, CTES). Mun. Terenos: ca. 1 km ao longo da estrada de acesso a Fazenda Modelo da EMBRAPA a partir da BR-262, 5-IV-1986, Valls & al. 9882 (CEN, CTES); ao longo da rodovia de acesso a antiga fazenda modelo do Ministerio da Agricultura a partir da BR-262, 18-IV-1984, Valls & al. 7621 (CEN, CTES). Mun. Rio Verde de M. Grosso: 20 km ao sul de Rio Verde e 1,2 km ao norte do corrego Matadeira a W da BR-163, 15-IV-1984, Valls & al. 7598 (CEN, CTES). Mun. São Gabriel do Oeste: km 551 da BR-163 e 62 km ao sul de Rio Verde, 15-IV-1984, Valls & al. 7599 (CEN, CTES); id., Valls & al. 7600 (CEN, CTES). Mun. Bandeirantes: 93 km S de Rio Verde e 105 km N de Campo Grande a W de BR-163, 15-IV-1984, Valls & al. 7602 (CEN, CTES). Mun. Jaraguari: km 463 da BR-163 e 48 km ao N de Campo Grande, a E da rodovia, 15-IV-1984, Valls & al. 7603 (CEN, CTES). Mun. Anaurilandia: km 90,6 da BR-267 a contar do rio Parana e a W de Bataguassu, 26-IV-1984, Valls & al. 7717 (CEN, CTES); id., 7718 (CEN).

Geographic distribution. This species inhabits the central part of Mato Grosso do Sul (Brazil), in high places, covering a range that extends from Nova Alvorada to Rio Verde and from Pedro Celestino (57 km W of Campo Grande) to Bataguaçu and Tres Lagoas, near the Paraná River. It prefers the deep red soils of the "cerrado."

Obs. *Arachis Oteroi* produces hybrids with *A. Hermannii* and with *A. paraguariensis* ssp. *paraguariensis* of its own section, and with *A. Rigonii* of the section *Procumbentes*. The hybrids obtained with the first species had a pollen

stain of 17.6%, while those obtained with the last two are very sterile.

6. *Arachis Hatschbachii* Krapov. & W.C. Gregory *nov. sp.*
Fig. 1,6

Herba perennis erecta. Radix palaris ramificationibus partes incrassatas elongatas gerentibus. Stipulae subglabrae, interdum basi villosiusculae, dorso setulosae, margine ciliatae. Foliola elliptica usque ovata apice subacuta, mucronulata, epiphyllo laevi, glabro, hypophyllo glabro vel paucis pilis diminutis adpressis vestito, nervo medio prominente, villoso, margine manifestiore, ciliato. Hypanthium ca. 5 cm longum. Calyx 6 mm longus, villosus setulis nonnullis longis immixtis. Vexillum aurantiacum supra lineis rubescentibus ornatum. Fructus subterraneus, biarticulatus, paxillo glabro horizontali 15-60 cm longo, isthmo ca. 2 cm longo, articulis 9-12 mm longis x 5.5-6 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. 25 km N de Bandeirantes, 100 km N de Campo Grande, erecta, clavos largos, horizontales, mato cerrado, suelo arena roja, 6-III-1959, Gregory, Krapovickas & Pietrarelli 9848 (CEN). Isotypes: CTES, G, LIL, P, RB, SI, SP.

Erect perennial. Deep-rooted, branch roots with elongated enlargements. One to four erect branches, some 20-40 cm long and up to 1.2 m tall, grow up from the collar with little or no further branching. Internodes 2-5 cm long, quadrangular, with corners very prominent, glabrous or somewhat villous, with scattered hairs on the young parts; bristles present toward the apex of the branches. Leaves tetrafoliolate. In well-developed leaves, the fused portion of the stipules 11-19 mm long x 5-7 mm wide, the free tips acute, 13-25 mm long. Petiole ca. 20 mm long (15-28 mm). Rachis 9-12 mm long. Apical pair of leaflets 30-51 mm long x 16-20 mm wide, the basal pair somewhat smaller, 27-45 mm long x 12-16 mm wide. Stipules with prominent veins, both surfaces subglabrous or occasionally somewhat villous toward the base of the fused portion, margin ciliate and with bristles on the back of the fused portion. Petiole and rachis canaliculate, canal margin ciliate, glabrous on the back or with a few scattered hairs and always with sparse bristles, 1-2 mm long. The bristles on the back of the fused portion of the stipules and on the back of the petiole and rachis are always present on the apical leaves, but may be lacking on basal leaves of the same branch. Leaflets elliptical to ovate, apex sub-acute, mucronulate; upper surface smooth, glabrous, with the margin little- or unmarked; lower surface glabrous or with scattered, diminutive adpressed hairs, midvein prominent, villous, margin somewhat marked, ciliate, with hairs extended in young leaves and curved in mature leaves, rarely some short bristles occur on the underside. Flowers clustered on the basal nodes buried in the soil; the axes of the inflorescences covered by the bases of the stipules. Hypanthium ca. 5 cm long, villous. Calyx 6 mm long, villous and with some long bristles. Standard orange, yellow at the base and with red lines on the front; wings orange with the apex yellow. Fruit subterranean; pegs horizontal, glabrous, somewhat sinuous, ca. 15-20 cm long and up to 60 cm; isthmus ca. 2 cm long; articles 9-12 mm long x 5.5-6 mm wide, pericarp smooth to lightly reticulate, covered by a dense coat of small hairs. Seeds 9-10 mm long x 5 mm wide. 2n=20 chromosomes (Smartt 1964, Smartt & Gregory 1967, GKP 9848).

Additional material: BRAZIL. **Mato Grosso do Sul.** Capão Redondo (mun. Rio Verde), 20-V-1973, Hatschbach 32105 (CTES, MBM); 190 km N de Campo Grande, camino a Cuiabá, 6-III-1959, Gregory & al. 9863 (GH, LIL, MO, NY, SI, US); 195 km N de Campo Grande, camino a Cuiabá, 6-III-1959, Gregory & al. 9865 (LIL, MO, NY, SI, US); 220 km N de Campo Grande, 6-III-1959, Gregory & al. 9869 (GH, LIL, MO, NY, SI, SP, US); 11 km N de Río Verde, 7-III-1959, Gregory & al. 9875 (GH, LIL, MO, NY, SI, US); 32 km N de Río Verde, 7-III-1959, Gregory & al. 9880 (GH, LIL, MO, NY, SI, US).

Geographic distribution. This species grows in a small area centered around Rio Verde de Mato Grosso (MS), between 270 and 500 m elevation.

Obs. Of all the crosses attempted, success was only obtained with *A. Archeri*, of the same section, but the resulting hybrid was totally sterile.

We dedicate this species to the botanist Gert Hatschbach who collected one of the specimens studied of this species.

7. *Arachis cryptopotamica* Krapov. & W.C. Gregory *nov. sp.*

Fig. 1,7

Herba perennis erecta. Radix ramificationibus tenuibus, partes incrassatas elongatas fusiformes efficientibus. Caules quadrangulares, novelli villosi. Stipulae glabrae subglabraeve dorso villosae usque subglabrae, margine dense ciliatae. Foliola elliptica usque ovata, apice obtusa subacutave, epiphyllo laevi, glabro, hypophyllo glabro aut pilis nonnullis diminutis adpressis, raro setulis immixtis vestito, nervo medio prominente pilos longos nonnullos gerente, obscure marginata, ciliata. Hypanthium 5.5-8.5 cm longum, laxe villosum. Calyx 6 mm longus, setulis nonnullis sparsim immixtis villosus. Vexillum 15 mm longum x 18 mm latum, aurantiacum. Fructus biarticulatus articulis 15-17 mm longis x 6-8 mm latis, apice recurvo, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso. Itiquira, río Correntes, 12 km W del km 352 de la ruta Cuiabá-Campo Grande, 54°57'W, 17°37'S, 14-XII-1976, Krapovickas & Gregory 30026 (UB). Isotypes: CEN, CTES, G, GH, K, LIL, MO, NY, P, RB, SI, SP, US.

Erect perennial. Main root deep with elongated enlargements, slender branch roots with elongated fusiform enlargements. A few sparse distichous, erect branches, 30-40 cm long (up to 60 cm) are borne from the collar of the plant. Internodes 25-35 mm long, up to 60 mm long, quadrangular with marked corners and cylindrical toward the base of the branches, usually villous on the young parts and glabrous from the middle to the base of the branches. Leaves tetrafoliolate. In well-developed leaves, the fused portion of the stipules 14-18 mm long x 6 mm wide, the free portion acute, 18-26 mm long; petiole 30-38 mm long; rachis 14-18 mm long; apical pair of leaflets 42-55 mm long x 20-24 mm wide, and the basal pair 39-50 mm long x 17-19 mm wide. Stipules with surfaces glabrous to subglabrous; back of the fused portion villous to subglabrous; margin densely ciliate. Petiole and rachis canaliculate, margin of both canals villous, the remainder subglabrous. Leaflets elliptical to ovate, apex obtuse to sub-acute, mucronulate; upper surface smooth, glabrous, with the margin inconspicuous; lower surface glabrous or with some diminutive, very adpressed hairs, rarely with some short bristles, midvein prominent with some long hairs toward the apex, margin little marked, ciliate. Flowers densely clustered at the collar of the plant and also present along the branches; axis of the inflorescences very short. Hypanthium 5.5-8.5 cm long, weakly villous. Calyx 6 mm long, villous and with a few scattered bristles. Standard 15 mm long x 18 mm wide, orange; wings 8-10 mm long, half yellow and half orange. Fruit subterranean, pegs growing horizontally, articles 15-17 mm long x 6-8 mm wide, recurved apex, blackish, pericarp smooth with lightly marked longitudinal veins.

Selected additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Sonora Gaucho (Benjamín Constant): 108 km N de Coxim, 54°48'W, 17°40'S, 8-III-1959, Gregory & al. 9889 (LIL, US). Mun. Coxim: km 379, camino Cuiabá a Campo Grande, 54°57'W, 18°24'S, 14-XII-1976, Krapovickas & al. 30024 (CEN, CTES, GH, MO, NY, US); Fazenda Buriti, Pantanal do Paiaguas, 65-70 km W del camino Cuiabá a Campo Grande, km 379, 55°15'W, 18°S, 14-XII-1976, Krapovickas & al. 30025 (CEN, CTES, G, GH, K, MO, NY, RB, US); 28 km W del camino Cuiabá a Campo Grande, 20 km N de Rio Verde, 55°10'W, 18°40'S, 13-XII-1976, Krapovickas & al. 30023 (CEN, CTES, GH, MO, NY, US); 32 km W del camino Cuiabá a Campo Grande, 20 km N de Rio Verde, 55° W, 18°S, 13-

XII-1976, Krapovickas & al. 29949 (CEN, CTES, US). Mun. Pedro Gomes: 17 km N de Coxim, BR-163, faz. Palmeira, 12-IV-1984, Valls & al. 7563 (CEN, CTES); id., Valls & al. 7565 (CEN); id., Valls & al. 7566 (CEN, CTES); Sumidouro do rio Corrente, 15 km NW da BR-163 (98 km N de Coxim), 13-IV-1984, Valls & al. 7568 (CEN, CTES); 200 m ao N do corrego Gaucho, BR-163, km 748,5, 13-IV-1984, Valls & al. 7572 (CEN, CTES). Mun. Coxim: 1,5 km S do rio Piquiri, BR-163, 13-IV-1984, Valls & al. 7574 (CEN, CTES). Mun. Rio Verde: Entrada da rodovia que liga a BR-163 ao corrego Feioso na serra da Alegria, 14-IV-1984, Valls & al. 7588 (CEN, CTES); id., Valls & al. 7590 (CEN, CTES); Sope da serra da Alegria na estrada para oeste que parte da BR-163, a 18 km N de Rio Verde, 14-IV-1984, Valls & al. 7593 (CEN, CTES); 12 km S de Rio Verde e 4 km ao norte de corr. Pereirinha a leste da BR-163, 15-IV-1984, Valls & al. 7596 (CEN, CTES). Mun. Coxim: faz. Santa Rosa, Paiaguás, 22-V-1986, Pott 2191 (CTES). Mun. Rio Verde: 1 km W da BR 463, ao longo da estrada para Rio Negro, 29-X-1985, Valls & al. 9455 (CEN, CTES).

Geographic distribution. This species grows in the northern extreme of the range of section *Erectoides*, from the Correntes River, the border between the states of Mato Grosso and Mato Grosso do Sul, to the vicinity of Rio Verde do Mato Grosso, in the "cerrado."

Obs. The name of this species derives from the character of the place from which the type was collected. There the Correntes River plunges into a great hole and runs for a distance below ground.

8. *Arachis major* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,8; 12,A-B

Arachis Diogoi Hoehne subsp. *major* Hoehne, Flora Brasílica 25(2) part. 122: 12, fig. pág. 4, 1940, *nomen nudum*. Otero, Serv. Inform. Agric. Min. Agric. 25-26, 1941. Mendes, Bragantia 7: 262 (2n=20), 1947. Otero, Serv. Inform. Agric. Sér. Did.11: 172-175, 1952. Conagin, Bragantia 18(5): 67, 1959. Conagin, Bragantia 21(21): 349-352, figs. 3,4 & 11, est. 4, 1962. Conagin, Bragantia 22(11): 126, 1963.

Herba perennis. Radix ramificationibus incrassatis. Caulis principalis erectus, rami decumbentes ramosissimi. Stipulae marginibus basi connatis tubum brevem 1.5 mm longum efficientes, subglabrae, dorso villosae, margine ciliatae. Foliola elliptica, acuta, epiphyllo laevi, pilis brevissimis erectis vestito, hypophyllo villoso, nervo medio prominente, obscure marginata, ciliata. Hypanthium 3.5-11.5 cm longum, villosum. Calyx 5-7 mm longus pilis longis sericeis setulis nonnullis immixtis vestitus. Vexillum 9-19 mm longum x 14-22 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali 5-30 cm longo, isthmo 2-20 mm longo, articulis 8-20 mm longis x 5-8 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Aquidauana, 19-V-1939, Otero 423-A (SP 41208!).

Perennial plant. Main taproot deep, with enlarged branch roots. Collar thick, with numerous clustered flowers which in fruiting produce a "mare's tail" of pegs. Mainstem erect, up to 80 cm tall, much branched, forming a bush of ca. 80 cm in diameter. Secondary branches decumbent, 30-75 cm long, tertiary branches 12-65 cm long and quaternary branches up to 45 cm long. Stem softly villous, internodes to 51 mm long, covered by the stipules toward the apex of the branches. Leaves tetrafoliolate. Fused part of the stipules 10-31 mm long, the free part 12-37 mm long; the margins usually united forming a short tube up to 1.5 mm long toward the base of the plant. Petiole 20-51 mm long; rachis up to 13 mm long. Leaflets elliptical, apical pair 16-58 mm long x 6-19.5 mm wide, the basal pair 12-51 mm long x 5-17 mm wide; on the mainstem the leaves are somewhat larger, the apical pair reaching 70 mm x 19 mm; length/width ratio 2-3.7:1. Stipules with prominent longitudinal veins, fused part villous, the free apices with subglabrous surfaces and margins with long cilia. Petiole and rachis villous; very infrequently bristles occur on the base of the stipules and on the

petiole. Leaflets smooth above, with abundant, very small erect hairs, especially on the young leaves, sometimes these small hairs are localized toward the base of the leaflet, along the midvein; lower surface with prominent midvein, villous, rarely with hairs more or less adpressed or with a few bristles; margin barely marked, ciliate, and also rarely with a few bristles. Spikes short, few-flowered, along the length of the branches and more frequently clustered on the half-buried collar of the plant. Hypanthium 3.5-11.5 cm long, softly villous. Calyx villous with long, silky hairs and some scattered bristles; lower lobe subfalcate, 6-7 mm long, upper lobe broad, 5-6 mm long. Standard 9-19 mm long x 14-22 mm wide, orange with a central yellow spot and with rosy lines on the upper surface; wings yellow. Fruiting clustered at the base of the plant and on the branches in contact with the soil. Fruit biarticulate; peg 5-30 cm long, somewhat villous toward the base, of horizontal growth, articles 2-10 cm deep; isthmus 2-20 mm long; articles 8-20 mm long x 5-8 mm wide, pericarp smooth, covered with a dense coat of diminutive hairs. Seeds 9-12.8 mm long x 3.2-5.3 mm wide, testa ochraceous or white. 2n=20 chromosomes (Mendes 1947 *sub A. Diogoi* ssp. *major* no. 85).

Selected additional material: BRAZIL. **Mato Grosso do Sul.** Aquidauana, 18-V-1939, Otero 423 (SP-41207); Aquidauana, campo de aviação, 22-V-1939, Otero 439 (SP 41210); Aquidauana, 27-II-1959, Gregory & al. 9825 (GH, LIL, MO, NY, SI, US); Aquidauana, aeródromo, 27-II-1959, Gregory & al. 9826 (GH, LIL, MO, NY, SI, SP, US); Aquidauana, 24-IV-1977, Gibbs & al. 5467 (UEC); 4 km W de Aquidauana, 30-VI-1977, Krapovickas & al. 30145 (CTES); Fazenda Santa Virginia, 7 leguas de Aquidauana, 20-V-1939, Otero 438 (RBR, SP 41209, SP 41210); 2 km E de Piraputanga 28 km E de Aquidauana, 9-IV-1968, Hammons & al. 555a (CEN, CTES, MO, NY, SI, SP, US); 23 km E de Aquidauana, 3-VII-1977, Krapovickas & al. 30151 (CEN, CTES, G, MO, NY, SP, US); id., 3-VII-1977, Krapovickas & al. 30153 (CEN, CTES, US); 33 km E de Aquidauana, camino a Campo Grande, 3-VII-1977, Krapovickas & al. 30154 (CEN, CTES, G, NY, SP, US); 4 km E de Joaquim Murtinho, 70 km W de Campo Grande, 9-VI-1968, Hammons & al. 551 (CEN, CTES, US); id., 9-VI-1968, Krapovickas & al. 14447 (CTES); Rodovia Campo Grande-Aquidauana ao longo dos kms 52 a 110, 25-I-1979, Leitão Filho & al. 9301 (UEC); Estrada Campo Grande-Aquidauana, km 110, 14-XII-1976, Shepherd & al. 4084 (UEC); 29 km O de Aquidauana, BR-262, 13-II-1993, Hatschbach & al. 59010 (CTES, MBM); 12 km E de Miranda, camino a Aquidauana, 12-XII-1976, Krapovickas & al. 30016 (CEN, CTES, G, GH, IAC, K, LIL, MO, NY, SI, SP, US); id., 12-XII-1967, Allem 699 (CEN); Miranda, XII-1944, Octacillo (IAC-7891, SP); Miranda, km 2-3 da rod. para Agachi, 13-II-1993, Hatschbach & al. 59045 (CTES, MBM); id., Hatschbach & al. 59049 (CTES, MBM); 40 km S de Aquidauana, camino a Nioaque, 10-VI-1968, Hammons & al. 559 (CEN, CTES, NY, SI, SP, US); 41 km S de Aquidauana, Fazenda Varzea Alegre, camino a Nioaque, 30-VI-1977, Krapovickas & al. 30144 (CEN, CTES, NY, SP, US); 5 km S de Nioaque, 10-VI-1968, Krapovickas & al. 14424 (CEN, CTES); 8 km W de Jardim, camino a Porto Murtinho, 10-VI-1968, Hammons & al. 562 (CEN, CTES, SP, US); BR-262, 8 km W do acesso a Palmeiras e 10 km E do rio Dois Irmaos, 18-IV-1984, Valls & al. 7628 (CEN, CTES); id., Valls & al. 7630 (CEN, CTES); 32 km W do acesso a Aquidauana, BR-262, 19-IV-1984, Valls & al. 7632 (CEN, CTES); 15 km da intersecção com a rodovia Guia Lopes-Jardim na estrada Bonito-Jardim, 21-IV-1984, Valls & al. 7644 (CEN, CTES); 8 km S da BR-262 no trecho Aquidauana-Nioaque, 16-IV-1985, Valls & al. 8530 (CEN, CTES). Mun. Rio Negro: 11,6 km SE da ponte sobre o rio Negro na estrada para Aquidauana, 29-X-1985, Valls & al. 9468 (CEN, CTES); id., 9469 (CEN); BR-262, km 462, 17 km E do Anastacio, 5-IV-1986, Valls & al. 9887 (CEN, CTES); 8 km S da BR-262 na estrada Aquidauana-Nioaque, 7-IV-1986, Valls & al. 9918 (CEN, CTES); Fazenda Dallas, logo a NW de Aquidauana, 29-X-1986, Valls & al. 10384 (CEN, CTES); 52 km NW de Aquidauana na estrada que penetra no Pantanal, 29-X-1986, Valls & al. 10397 (CEN, CTES); Saida N de Aquidauana, 30-X-1986, Valls & al. 10407 (CEN, CTES); Bela Vista, Fazenda Formosa, a 4,5 leguas da cidade de Bela Vista, 11-V-1939, Otero 402 (RBR, SP); 20-25 km de Bela Vista, camino a Ponta Porã, 14-II-1959, Gregory & al. 9651 (LIL, US); 37 km E de Bela Vista, 26-VI-1977, Krapovickas & al. 30128 (CEN, CTES, NY, US); 50 km E de Bela Vista, 26-VI-1977,

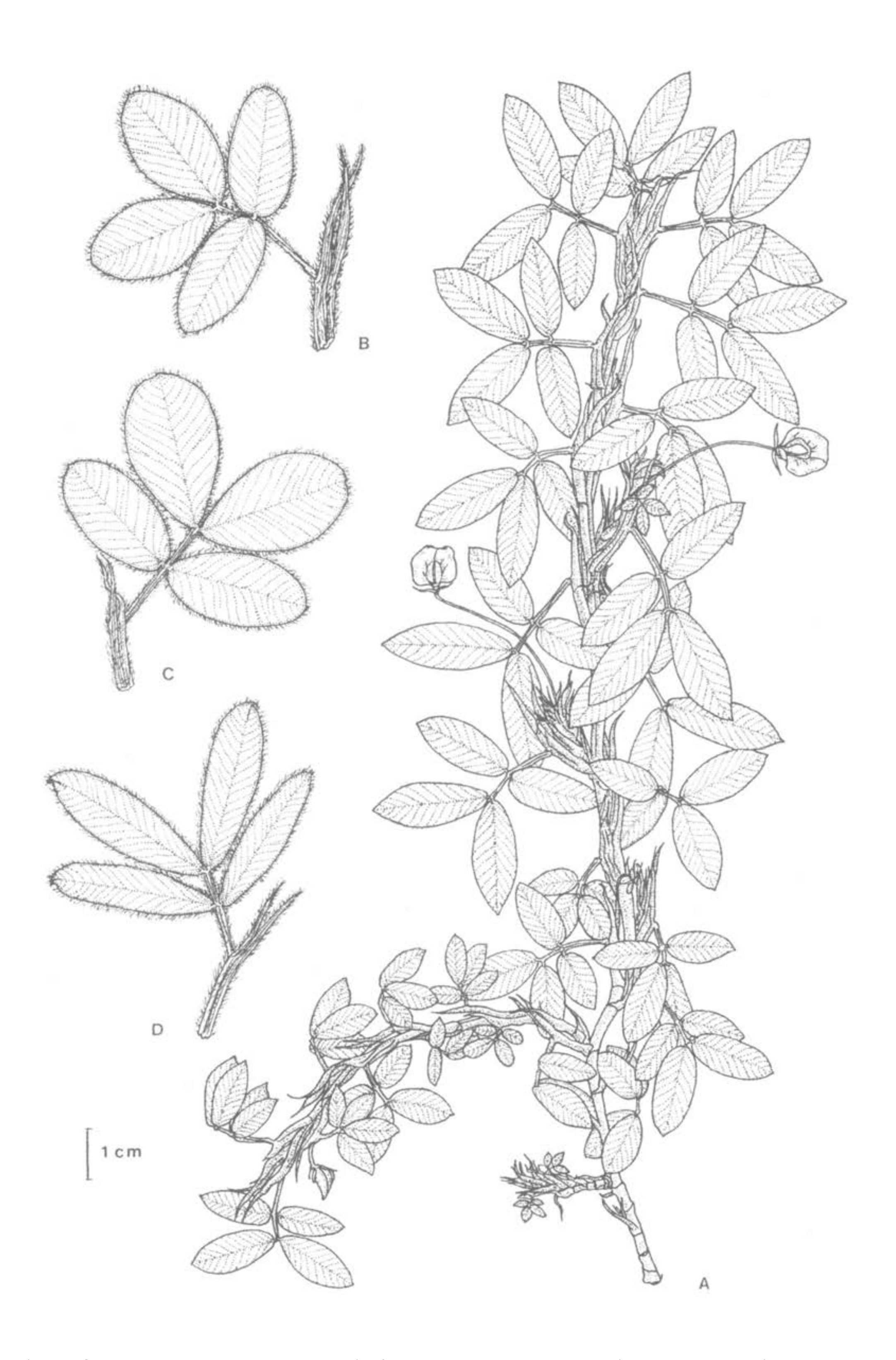


Fig. 12. *Arachis major*: A, branch (G.9825); B, leaf (G.10580). *A. Benthamii*: C, leaf (G.9753). *A. douradiana*: D, leaf (G.9799).

Krapovickas & al. 30129 (CEN, CTES); Estancia Dr. Castro Pinto, 11-16 km W de Colonia Penso, actualmente Antonio João, camino Ponta Porã a Bela Vista, 13-II-1959, Gregory & al. 9641 (LIL, US); 10 km W de Colonia Penso (Antonio João), 13-II-1959, Gregory & al. 9638 (LIL, MO, NY, US); id., 14-II-1959, Gregory & al. 9652 (LIL, NY, US); 15 km W de Bela Vista na estrada para São Carlos, 22-IV-1984, Valls & al. 7672 (CEN, CTES); 16 km W de Bela Vista, 22-IV-1984, Valls & al. 7676 (CEN, CTES).

PARAGUAY. **Amambay.** 30 km W de Pedro Juan Caballero, camino a Concepción, 12-II-1959, Gregory & al. 9632 (LIL, NY, US); 48 km SW de Pedro Juan Caballero, 16-V-1961, Gregory & al. 10573 (GH, LIL, MO, NY, US); 54 km SW de Pedro Juan Caballero, 16-V-1961, Gregory & al. 10575 (CTES, GH, LIL, MO, NY, US); 62 km SW de Pedro Juan Caballero, 16-V-1961, Gregory & al. 10576 (LIL, MO, NY, US); 70 km SW de Pedro Juan Caballero, 16-V-1961, Gregory & al. 10580 (CTES, LIL, MO, NY, US); Cerro Corá (ca. 40 km W de Pedro Juan Caballero), 14-VII-1968, Krapovickas & al. 14444 (CEN, CTES, G, K, NY, SI, SP, US); Cerro Corá (13 km W de Pedro Juan Caballero), erecta, borde de selva, 24-II-1968, Krapovickas & al. 14168 (BAA, CEN, CTES, G, K, MO, US); Colonia Yvypyté, 56°W, 23°S, aeropuerto, 20-VIII-1989, Schinini & al. 20467 (CEN, CTES, G, MO, SI); id., 20-VIII-1980, Schinini & al. 20469 (CTES); 45 km S de Bella Vista, camino a Ruta 5, 26-II-1994, Krapovickas & al. 45037 (CTES). **Concepción.** 2 km E de Ñu Porá (antiguo camino Pedro Juan Caballero-Concepción), 56°21'W, 23°8'S, 16-V-1961, Gregory & al. 10582 (LIL, US); Ñu Porá, 16-V-1961, Gregory & al. 10588 (LIL, US).

Common name. "amendoim de Aquidauana" (Otero 1952: 172).

Geographic distribution. Species grows to the south of the Gran Pantanal in a zone that extends west of the Serra de Maracajú (Mato Grosso do Sul) and the Sierra Amambay in Paraguay, usually below 300 m elevation. It prefers deep red soils in open woodlands.

Obs. Usually, *Arachis major* shows no bristles on the leaves, but the specimens Hammons & al. 551 and 555a consist of individuals with and without bristles on the petiole and on the base of the stipules. It is interesting to note that the closest species, *A. Benthamii*, very frequently shows bristles on the back of the leaflets, but totally lacks bristles on the petioles and stipules.

Arachis major is very similar to *A. Benthamii*, with which it differs primarily by its greater size. In various specimens from west of the Sierra de Maracajú, which is the boundary between the two species, the chromatographic profiles obtained had very few blots. In contrast, the material from the east of the same mountains, which corresponds to *A. Benthamii*, has more complex profiles and always with the presence of one very notable blot (no. 8) (Krapovickas 1973: 139 and Seeligmann, pers. comm.).

In crosses between two populations of *A. major*, one from the north of its range (HLK 559) and the other from the extreme south (GK 10582), we obtained hybrids with very little pollen fertility (11.7%). These are possibly two different entities, but more study would be necessary to define them.

Arachis major shows very good affinity with *A. gracilis*, with 30% pollen stain in the hybrids, and with *A. Archeri* (17.6 and 40%). It is easy to distinguish *A. major* from these two species because their leaflets are lanceolate, not elliptical like *A. major*.

With *A. paraguariensis* ssp. *paraguariensis*, of the same section, it produces hybrids that are highly sterile (0.5% pollen stain). We also obtained hybrids by crossing *A. major* with *A. guaranitica* and *A. tuberosa* of section *Trierectoides*, with *A. repens* of section *Caulorrhizae*, with *A. appressipila* and *A. Rigonii* of section *Procumbentes*, and with *A. glabrata* var. *glabrata*, the tetraploid taxon of section *Rhizomatosae*; in all cases with a very high degree of sterility.

9. *Arachis Benthamii* Handro

Figs. 1,9; 12,C

Handro, Arq. Bot. Estado São Paulo 3: 179, táb.

45, 1958.
"Brasil, Estado de Mato Grosso, Campo Grande, cultivada en São Paulo, fl. 12/1/1957, fr. VIII/1957, leg. Oswaldo Handro 682 (SP 55525 TYPUS)."

Arachis marginata Gardner forma *submarginata* Hoehne, Flora Brasílica 25(2) part. 122: 16-17, táb. 11, fig. 1, 1940, *nomen nudum, pro parte, specimina Mato Grossi tantum inclusa.* Mendes, Bragantia 7: 262, fig. 1 & 2 (2n=20), 1947, as *A. marginata* var. *submarginata*.

Perennial plant. Taproot deep, with thickened branch roots, which commonly also arise on the hypocotyl. Collar enlarged, with numerous clustered flowers, which upon fruiting produce a "mare's tail" of pegs. Stems erect, up to 75 cm tall, and also somewhat decumbent, angular, villous, glabrescent on the basal nodes. Toward the apex of the branches the upper third is totally covered by the stipules. Secondary branches short, the largest up to 30 cm long, the branching ordinarily terminates with short tertiary branches up to 10 cm long. Leaves tetrafoliolate. Fused part of the stipules 8-22 mm long, the free part 12-23 mm long, toward the base the margins unite forming a tube up to 4 mm long. Petiole usually 10 mm long but up to 30 mm long. Rachis some 5 mm long but up to 10 mm long. Leaflets elliptical, the lower pair always narrower and somewhat shorter, apex obtuse and sometimes sub-acute; length/width ratio commonly 2:1, in extreme cases it can reach 1.5:1 and 3:1; in typical well-developed leaves, the apical pair measures 37 mm long x 18 mm wide, the basal pair 35 mm long x 16 mm wide. The basal part of the stipules striated, villous with abundant silky hairs; the free part lanceolate, acuminate, with marked longitudinal veins, villous, and with ciliate margins. Petiole and rachis canaliculate, villous. Leaflets with upper surface smooth, hirsute, covered with very short hairs that permit seeing the epidermis; lower surface villous, entirely covered with loose, silky hairs, frequently with some bristles on the secondary veins, midvein very prominent, margin somewhat marked, generally wavy when dry, ciliate. Spikes short, few-flowered, occurring all along the branches, and more frequently clustered densely on the half-buried collar of the plant. Hypanthium 3-8 cm long, more or less villous with silky hairs. Calyx densely villous with long, silky hairs and some scattered, long bristles; lower lobe subfalcate, 7-8 mm long, upper lobe broad, 6-7 mm long. Standard 7-14 mm long x 12-23 mm wide, orange with a central yellow spot and with rosy lines on the upper surface; wings yellow with orange apex. Fruiting clustered at the base of the plant. Fruit biarticulate, peg 6-42 cm long, growing horizontally, isthmus 0.5-5 cm long; articles 10-16 mm long x 5-7 mm wide, pericarp smooth, covered by a dense coat of diminutive hairs. Seed coat ochraceous or white. 2n=20 chromosomes (Mendes 1947, no. 83).

Holotype: BRAZIL. Mato Grosso do Sul. Campo Grande, cultivada em São Paulo, fl. 12-I-1957, fr. VIII-1957, Handro 682 (SP 55525!). Isotypes: K!, US!.

Selected additional material: BRAZIL. **Mato Grosso do Sul**. Mun. Campo Grande: Campo Grande, Capão Bonito, 1-IX-1936, Archer 3982 (SP); Campo Grande, 10-II-1979, Krapovickas & al. 34549 (CEN, CTES, G, K, MO); 17 km S de Campo Grande, 3-VII-1977, Krapovickas & al. 30157 (CEN, CTES, US); id., 30158 (CEN, CTES, NY, US); Rodovia Campo Grande-São Paulo, km 25, 10-VI-1976, Leitão Filho 2119 (UEC); Rodovia Coxim-Cpo. Grande, a 471 km de Cuiabá, 23-IV-1978, Shepherd & al. 7589 (UEC). Mun. Terenos: 59 km W de Campo Grande, camino a Aquidauana, 3-VII-1977, Krapovickas & al. 30156 (CTES); 4 km E de Murtinho (70 km W de Campo Grande), 9-VI-1968, Hammons & al. 550 (CEN, CTES). Mun. Anastácio: 2 km W de Palmeira (50 km E de Aquidauana), 9-VI-1968, Hammons & al. 554 (CEN, CTES, SP, US); 80 km W de Campo Grande (BR-262), 28-I-1979, Ferreira M.B. s/n (CEN, CTES); 85 km W de Campo Grande, 28-I-1979, Krapovickas & al. 34434 (CEN, CTES); 4 km a leste de Palmeiras, BR-262, 18-IV-1984, Valls & al. 7622 (CEN, CTES); id., Valls & al. 7627 (CEN, CTES). Mun. Sidrolandia: 70 km S de Campo Grande, BR-163, 1-III-1959, Gregory & al. 9805 (GH, LIL, MO, NY, SI, US). Mun. Rio Brilhante:

Rio Anhandui, 23-X-1970, Hatschbach 25104 (CTES, MBM); Entroncamento BR-163 y BR-267 (Nova Alvorada), 1-III-1959, Gregory & al. 9803 (LIL); 5 km N de Entroncamento, 7-VI-1968, Hammons & al. 523 (BAA, CTES, SI, UC); 10 km E de Entroncamento, 1-III-1959, Gregory & al. 9795 (GH, LIL, MO, NY, SI, US); 9 km E de Entroncamento, 11-V-1961, Gregory & al. 10547 (LIL, US); id., 10548 (LIL, NY, US); BR-267, 5 km a leste do Entroncamento com a BR-163, 26-IV-1984, Valls & al. 7712 (CEN, CTES). Mun. Brasilandia: 7 km N de porto Ueré, río Pardo, 26-II-1959, Gregory & al. 9761 (GH, LIL, MO, NY, SI, SP, US); 30 km SE de Xavantina, 26-II-1959, Gregory & al. 9764 (GH, LIL, MO, NY, SI, SP, US); entre Xavantina y fazenda Pouso Alto, 27-II-1959, Gregory & al. 9769 (GH, LIL, MO, NY, SI, US); Xavantina, 27-II-1959, Gregory & al. 9774 (LIL, US). Mun. Bataguaçú: Córrego Feio, 15-II-1970, Hatschbach 23570 (CTES, MBM); 42 km W de Porto 15 de Novembro, Hammons & al. 520 (CTES, SI, US); Bataguaçú, 26-II-1959, Gregory & al. 9753 (CTES, GH, LIL, MO, NY, SI, SP, US); 25 km W de Bataguaçú, 28-II-1959, Gregory & al. 9776 (GH, LIL, MO, NY, SI, SP, US). Mun. Anaurilandia: 50 km W de Bataguaçú, BR-267, 28-II-1959, Gregory & al. 9784 (GH, LIL, MO, NY, US). Mun. Rio Verde: Rio Verde, 13-XII-1976, Krapovickas & al. 30018 (CEN, CTES, GH, MO, NY, SP, US); Base de la escarpa de Serra Alegre, ca. 20 km N de Rio Verde, 13-XII-1976, Krapovickas & al. 30022 (CTES, US); 52 km N de Rio Verde, 7-III-1959, Gregory & al. 9883 (LIL, US); BR-163 a 13,2 km sul do rio Taquarí, 14-IV-1984, Valls & al. 7585 (CEN, CTES); BR-163, 18,7 km S do rio Taquarí. 14-IV-1984, Valls & al. 7586 (CEN, CTES); 2,6 km N da vila de Perdigao, na estrada de Rio Verde a Rio Negro, 29-X-1985, Valls & al. 9456 (CEN, CTES). Mun. Coxim: Rio Taquarí, 13-XI-1973, Hatschbach & al. 33179; Iate Clube Rio Verde na margem sul do rio Taquarí, 12-IV-1984, Valls & al. 7557 (CEN, CTES); BR-163, 1,5 km N de Coxim, 14-IV-1984, Valls & al. 7578 (CEN, CTES); BR-163, 5 km N de Coxim, 14-IV-1984, Valls & al. 7581 (CEN, CTES); 1 km N de Coxim, 9-II-1975, Anderson 11298 (MBM); Coxim, BR-163, 1900 m N del río Taquarí, 31-I-1989, Krapovickas & al. 43165 (CEN, CTES). Mun. Pedro Gomes: rod. BR-163, 12-XI-1975, Hatschbach 37425 (CTES). Mun. Guia Lopes da Laguna: 12 km W de Ervania, BR-267, 24-X-1986, Pedersen 14711 (CTES, Herb. Pedersen); Tres Lagoas, 23-II-1981, Oliveira 21 (UEC).

Geographic distribution. This species grows in east central Mato Grosso do Sul, to the east of the Serra de Maracajú, in a broad area whose rivers flow toward the Río Paraná. It is found preferably in the "cerrado," in places more or less shaded.

Obs. This species is very similar in appearance to *A. major*, from which it differs primarily by having fewer branches. However, the differences are more notable in the chromatographic profiles. The material from the west of Serra de Maracajú, that we identify as *A. major*, has very simple profiles with few blots, in contrast, the material from east of those mountains, which we consider to be *A. Benthamii*, has more complex profiles and with the presence of blot "8" (Krapovickas & al. 1974: 139 and Seeligmann, pers. comm.).

Artificial hybrids were obtained with *A. Hermannii* and *A. paraguariensis* ssp. *paraguariensis*, of the same section; with *A. appressipila* and *A. Rigonii* of section *Procumbentes* and with *A. glabrata* var. *glabrata* of section *Rhizomatosae*. All the hybrids are highly sterile, except that obtained with *A. Hermannii*, which had a 19.1% pollen stain.

10. *Arachis douradiana* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,10; 12,D

Herba perennis erecta. Radix ramificationibus uniformiter crassis. Caulis quadrangularis, villosus. Stipulae basi marginibus connatis tubum usque ad 3 mm longum efficientes, pilis plus minusve adpressis vestitae, dorso hirsutae, margine ciliatae. Foliola elliptica apice acuto, leviter plicato, epiphyllo laevi pilis brevissimis plus minusve erectis copiose vestito, hypophyllo villoso, nervo medio prominente, hirsuto, margine manifestiore, laxe ciliata. Hypanthium 0.5-3 cm longum, villosum. Calyx 4 mm longus, villosus. Vexillum 6 mm longum x 7 mm latum, aurantiacum. Fructus biarticulatus, paxillo horizontale usque

ad 30 cm longo, isthmo usque ad 5 cm longo, articulis 10-12 mm longis x 5-6 mm latis, apice paulo recurvo, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Mun. Dourados, 5 km NE de Dourados, lugar abierto en bosque, erecta, 12-V-1961, Gregory & Krapovickas 10556 (LIL). Isotypes: GH, MO, NY, US.

Perennial plant, erect, small. Taproot small, 5 cm in diameter near the collar, with branch roots uniformly enlarged. Flowers densely clustered at the collar of the plant, covered by the soil, that upon fruiting form a "mare's tail" of pegs. Mainstem erect, some 30 cm tall, little-branched, with some reproductive branches, and secondary branches (n+1) somewhat arched at the base and later upright but not surpassing the mainstem, little or no branching of the n+1. Tertiary branches (n+2), if present, are very short, not more than 5 cm long. Frequently, the plants have only a mainstem. Stem quadrangular, villous, glabrescent toward the base of the plant; internodes 1-3 cm long. Leaves tetrafoliolate. Fused part of the stipules 8-11 mm long, with the margins fused at the base forming a short tube up to 3 mm long; the free part 10-15 mm long. Petiole 6 mm long (rarely up to 9 mm). Rachis 6-7 mm long. Leaflets oblong, apex acute, lightly plicate, base somewhat asymmetric; apical pair 18-42 mm long x 6-11 mm wide (length/width ratio 2.3-4.2:1), basal pair 17-38 mm long x 5-12 mm wide; toward the base of the plant the leaflets may be elliptic. Stipule surfaces with hairs more or less adpressed, smaller toward the apex of the free tips; the back of the fused part hirsute with long hairs, 1-1.5 mm long; margin longly ciliate. Petiole and rachis with the back villous to hirsute, canal of both very narrow, subglabrous. Pulvinus villous. Leaflets with smooth upper surface, with abundant, very short, more or less erect hairs; lower surface villous with long soft hairs, midvein prominent, hirsute, with long, more or less straight hairs 1-1.5 mm long; margin somewhat marked on the underside of the leaflet, longly ciliate. Flowers clustered principally at the collar of the plant, in very short spikes. Hypanthium 0.5-3 cm long, villous. Calyx villous, lower lobe falcate, 4 mm long; upper lobe broad, 3.5 mm long. Standard orange, 6 mm long x 7 mm wide (dry). Fruiting clustered at the base of the plant or on the branches in contact with the soil. Fruit biarticulate; peg up to 30 cm long, growing horizontally from 1-3 cm deep in the soil; isthmus up to 5 cm long; articles 10-12 mm long x 5-6 mm wide, with beak little-marked; pericarp smooth, covered by a dense coat of diminutive hairs.

Additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Rio Brilhante: 10 km E de Entroncamento, rutas Pto. 15 Nov.-Campo Grande-Dourados, 1-III-1959, Gregory & al. 9799 (GH, LIL, MO, NY, US); id., Gregory & al. 9800 (LIL, GH, MO, NY, US); 5 km SW de Rio Brilhante, 12-V-1961, Gregory & al. 10554 (LIL, US); 30 km W de Rio Brilhante, estrada a Maracajú, 20-VII-1977, Gibbs & al. 5338 (UEC); Rio Brilhante, 26-IV-1984, Valls & al. 7709 (CEN, CTES); BR-267, 5 km E do entroncamento com a BR-163, 26-IV-1984, Valls & al. 7711 (CEN, CTES). Mun. Dourados: 28 km SW de Dourados, 12-V-1961, Gregory & al. 10557 (LIL, US); Dourados, 25-IV-1984, Valls & al. 7707 (CEN, CTES). Mun. Maracajú: Maracajú, 3-II-1952, Kuhlmann (SP 69929); 4 km S do rio Brilhante, estrada Maracajú-Sidrolandia, 20-IV-1985, Valls & al. 8644 (CEN, CTES). Mun. Antonio João: 5 km NW de Colonia Penso (actualmente Antonio João), 22°10'S, 56°W, 13-II-1959, Gregory & al. 9636 (GH, LIL, MO, NY, US); 10 km W de Colonia Penso, 13-II-1959, Gregory & al. 9639 (LIL). Mun. Caarapó: 9 km W de Caarapó, 19-I-1979, Krapovickas & al. 34336 (CEN, CTES, G, K, SP, US).

Geographic distribution. This species grows in the south of Mato Grosso do Sul in the zone of "campos limpos" (Andrade-Lima 1966), in the county of Dourados and neighboring counties. Grows in open places, in grasslands.

11. *Arachis gracilis* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,11; 13

Herba perennis. Radix palaris ramificationibus incrassatis. Caulis principalis erectus ramis

procumbentibus, arcuatis, gracilibus. Caules quadrangulares, subvillosi. Stipulae basi marginibus connatis tubum brevem efficientes, dorso villosae usque subglabrae, setulosae, margine ciliatae. Foliola longe elliptica, acuta, aliquanto discolora: epiphyllo glabro subglabrove basi pilos nonnullis gerente, hypophyllo pallidiore pilis adpressis et setulis rigidis sparsis, in nervo medio aliquanto majoribus vestito, margine ciliata. Hypanthium 3-8 cm longum, villosum. Calyx 4-5 mm longus, villosus, setulis sparsim immixtis. Vexillum 10-12 mm longum x 11-13 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali usque ad 32 cm longo, isthmo 5 cm longo, articulis 10.5-12.5 mm longis x 5-6 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Mun. Nova Andradina, Fazenda São Jorge, 80 km W de Bataguaçú, 275 m s.m., 28-II-1959, Gregory, Krapovickas & Pietrarelli 9788 (LIL). Isotypes: GH, MO, NY, US.

Taprooted perennial with enlarged branch roots. Mainstem more or less erect, little branched, lateral branches 30-50 cm long, procumbent, arched, wavy, gracile. Internodes 2-3 cm long, exceeded by the stipules, longer toward the base of stems, up to 6.5 cm, quadrangular, subvillous in the young parts, later subglabrous. Leaves tetrafoliolate. Fused portion of the stipules 9-15 mm long, briefly tubular toward the base, the free portion very acute, 11-21 mm long x 1-1.5 mm wide. Petiole 10-18 mm long, up to 25 mm. Rachis 4-10 mm long. Leaflets long elliptic, somewhat asymmetric at the base, acute, mucronulate, length/width ratio 4-8:1, apical pair 23-47 mm long x 3-10 mm wide, the basal pair somewhat smaller, 21-41 mm long x 3-8 mm wide. Stipules rigid, with marked veins, villous to subglabrous, with bristles on the back; free portion with ciliate margin. Petiole and rachis more or less villous and with rigid bristles, more abundant on the back of the petiole. Leaflets somewhat two-toned, margin somewhat thickened on the back; upper surface subglabrous to glabrous, with some short hairs clustered at the base of the midvein; lower surface lighter in color, with scattered adpressed hairs, rarely somewhat villous, and always with rigid bristles, midvein with hairs somewhat longer and margin with scattered cilia. Flowers densely clustered at the base of the plant and also present along the length of the stems; axis of the inflorescences very short. Hypanthium 3-8 cm long, shorter in basal flowers, villous. Calyx villous and with scattered bristles, 4-5 mm long, narrow lobe subfalcate, 6-7 mm long. Standard orange, 10-12 mm long x 11-13 mm wide, wings 6-6.5 mm long, yellow. Fruit subterranean, biarticulate; peg growing horizontally, up to 32 cm long, thin, glabrous; isthmus some 5 cm long; articles 10.5-12.5 mm long x 5-6 mm wide, pericarp smooth; seed 8.5 mm long x 4 mm wide. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Selected additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Brasilandia: Xavantina, 27-II-1959, Gregory & al. 9772 (GH, LIL, MO, NY, US). Mun. Bataguaçú: 42 km al W de Porto 15 de Novembro, 7-VI-1968, Krapovickas 14389 (CTES); 25 km W de Bataguaçú, 28-II-1959, Gregory & al. 9775 (GH, LIL, MO, NY, US). Mun. Rio Brilhante: río Anhandui, 23-X-1970, Hatschbach 25149 (CTES, MBM); 5 km E de Entroncamento estrada 15 Nov.-Campo Grande-Dourados, 11-V-1961, Gregory & al. 10551 (LIL, US). Mun. Ribas de Rio Pardo: 5 km E de Ribas de Rio Pardo, río Pardo, 3-III-1959, Gregory & al. 9829 (LIL, US); Ribas do Rio Pardo, río Botas, 25-I-1979, Krapovickas & al. 34361 (CEN, CTES, US). Mun. Anaurilandia: km 90,6 da BR-267, a contar do rio Paraná e a W de Bataguassú, 26-V-1984, Valls & al. 7715 (CEN, CTES); id., Valls & al. 7716 (CEN, CTES).

Geographic distribution. This species grows in areas adjoining the Pardo River, in the SE of Mato Grosso do Sul, from Ribas de Rio Pardo in the north, to Bataguaçú in the southeast. It prefers sandy, ashen soils near watercourses.

Obs. *Arachis gracilis* is a species that has a special ability to cross between sections. It crosses with *A. tuberosa* (18.7% pollen stain) and with *A. guaranitica* (10.3%) of section *Trierectoides*, with *A. Rigonii* (12.2%) of



Fig. 13. *Arachis gracilis*: plant (K.34361).

section *Procumbentes* and with *A. duranensis* (0%) of section *Arachis*. Within its own section it produced hybrids with *A. paraguariensis* ssp. *paraguariensis* (1.7%), with *A. Martii* (6.2%), with *A. Hermannii* (20.1%) and with *A. major* (30%). As in the case with other *Arachis* species with good crossing ability, *A. gracilis* grows on the eastern edge of the range of section *Erectoides* and does not grow together with any of the taxa with which it would produce hybrids.

12. *Arachis Hermannii* Krapov. & W.C. Gregory *nov. sp.*

Fig. 1,12

Herba perennis. Radix palaris profunda, crassa, fusiformis, ramificationibus incrassatis. Caulis principalis erectus ramis decumbentibus. Caulis subglaber. Stipulae marginibus basi connatis tubum usque ad 9 mm longum efficientes, pilis diminutis adpressis dorso longis vestitae, margine ciliatae. Foliola ovato-lanceolata epiphyllo sub-glabro, basi pilos nonnullis gerente, hypophyllo pilis adpressis paulo conspicuis setulisque sparsis, in nervo medio prominenti majoribus vestito, conspicue marginata, margine pilis recurvis plus minusve densis instructo. Hypanthium 5-10 cm longum, villosum. Calyx 6-7 mm longus, setulis nonnullis immixtis subvillosus. Vexillum 14-16 mm longum x 15-18 mm latum, aurantiacum. Fructus biarticulatus, paxillo horizontali usque ad 43 cm longo, isthmo 0.5-11.5 mm longo, articulis 9-12 mm longis x 5-7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. 54 km N de Campo Grande, camino a Cuiabá, 5-III-1959, Gregory, Krapovickas & Pietrarelli 9841 (LIL). Isotypes: GH, MO, NY, US.

Erect perennial. Taproot deep, with fusiform thickenings and with enlarged branches. Mainstem erect with a predominance of vegetative branches on the first 14 nodes, on the remainder (up to node 18) reproductive branches predominate. Lateral branches decumbent, 50-80 cm long, n+1 branches predominantly vegetative, and n+2 branches predominantly reproductive. Internodes up to 50 mm long, quadrangular, subglabrous to slightly pubescent. Leaves tetrafoliolate, well separated. Basal part of the stipules 14-25 mm long, with the fused margins forming a basal tube some 9 mm long which, with the growth of the stem, is broken, leaving the margins necrotic; the free parts very acute, 20-35 mm long x 1-1.5 mm wide. Petiole 15-35 mm long, rachis 7-11 mm long. Leaflets ovate-lanceolate, mucronulate at the apex, length/ width ratio 3-7:1, the apical pair 29-62 mm long x 8-10 mm wide, the basal pair 27-59 mm long x 6-8 mm wide. Stipules with very prominent veins, subglabrous surfaces, with diminutive adpressed hairs and with long hairs on the back of the fused portion; the free tips are usually longer than the petiole, linear, rigid, with ciliate margin. Petiole and rachis with adpressed hairs on the back, the margins of both canals ciliate. Upper surface of the leaflets subglabrous, with some hairs at the base of the midvein, very young leaves with very small scattered hairs, smooth, with inconspicuous margin; lower surface with inconspicuous adpressed hairs, scattered bristles and long hairs, more or less adpressed, along the midvein, veins and margin prominent; margin with more or less dense, recurved hairs. Flowers and fruits clustered at the collar of the plant, flowers also occurring along the length of the branches, but these are usually unfruitful if they are not in contact with the soil. Hypanthium 5-10 cm long, villous. Calyx subvillous with a few bristles, the wider lobe 6-6.5 mm long, the narrower lobe subfalcate, 7 mm long. Standard orange, 14-16 mm long x 15-18 mm wide; wings 7-9 mm long. Fruit subterranean, biarticulate; peg growing horizontally, commonly ca. 17 cm long and up to 43 cm long, glabrous; isthmus from very short (5-10 mm long) up to 11.5 cm long; articles 9-12 mm long x 5-7 mm wide, the distal one always larger than the basal, pericarp smooth. Seed 10-13 mm long, 5-6 mm wide. 2n=20 chromosomes (Smartt 1964; GKP 9843; Smartt & Gregory 1967, *sub A. Diogoi*).

Additional material: BRAZIL. **Mato Grosso do Sul.** 54 km N de Campo Grande, 5-III-1959,

Gregory & al. 9839 (GH, LIL, MO, NY, SI, SP, US); id., 9843 (LIL, SI). Mun. Coxim: proximo a BR-163, ao longo da Estrada paralela ao rio Taquari, para oeste, margem sul, 12-IV-1984, Valls & al. 7555 (CEN, CTES); 1,5 km oeste da BR-163, ao longo da estrada paralela ao rio Taquari, 12-IV-1984, Valls & al. 7560 (CEN, CTES); Coxim, 31-X-1986, Valls & al. 10426 (CEN, CTES); id., Valls & al. 10427 (CEN, CTES). Mun. Rio Verde de M. Grosso: Corrego Fundo na BR-163, a 8 km N do Rio Verde, 14-IV-1984, Valls & al. 7594 (CEN, CTES). Mun. Aquidauana: entre as fazendas Buritizinho e Boa Vista, ao longo da estrada que sai para noroeste de Aquidauana, 29-X-1986, Valls & al. 10386 (CEN, CTES); id., Valls & al. 10387 (CEN, CTES); entre as fazendas Boa Vista e Alegrete ao longo da estrada que sai para noroeste de Aquidauana, 29-X-1986, Valls & al. 10390; 52 km NW de Aquidauana ao longo da estrada que penetra no Pantanal, 29-X-1986, Valls & al. 10396 (CEN, CTES).

Geographic distribution. This species grows in the center of Mato Grosso do Sul, to the north of Aquidauana and Campo Grande, extending to Coxim, between 160 and 330 m elevation.

Obs. 1. Hybrids have been obtained between *A. Hermannii* and *A. appressipila* and *A. Rigonii* of section *Procumbentes*; with *A. duranensis*, an annual species of section *Arachis*; and with *A. glabrata* var. *glabrata* and *A. pseudovillosa* of section *Rhizomatosae*. The hybrids with section *Rhizomatosae* never flowered and the other intersectional hybrids have a very low percentage of fertile pollen.

Within its own section, *A. Hermannii* produces hybrids with *A. Benthamii*, *A. gracilis* and *A. Oteroi*, with pollen fertility of 17.6 to 20.1%. On the other hand, with *A. paraguariensis* ssp. *paraguariensis* the hybrids produced pollen with a very low pollen stain (0.9 to 4.3%).

Obs. 2. In the shape of its leaflets, *A. Hermannii* has a great resemblance to *A. paraguariensis* ssp. *paraguariensis*, notwithstanding these two taxa are differentiated by the erect stems and enlarged roots of the first, and the sinuous stems and roots without enlarged branches of the second. There are also differences in the chromatographic profiles in that *A. paraguariensis* has two blots, 7 and 8, which are missing in *A. Hermannii* (Krapovickas 1973: 139 and Seeligmann pers. comm.).

Obs. 3. The specimen Valls 7594 is differentiated from the other material by the presence of bristles on the stipules and the petiole, but is the same in the shape of the leaflets and in the nature and distribution of the tomentum.

We dedicate this species to the botanist F.J. Hermann (Horticultural Crops Research Branch, USDA), author of "A Synopsis of the Genus *Arachis*" (1954).

13. *Arachis Archeri* Krapov. & W.C. Gregory *nov. sp.*

Fig. 1,13

A. Diogoi auct non Hoehne, Hoehne, Flora Brasílica 25(2) part. 122: 10, 1940, tab. 2, 1919. Otero, Serv. Inform. Agric. Min. Agric., figs. pags. 30, 34, 35, 51. (n. 454), 1941. Mendes, Bragantia 7: 262, 2n=20, 1947. Otero, Serv. Inform. Agric. Sér. Did. 11: 170-172, 1952. Conagin, Bragantia 21: 352, est. 5, figs. 5A, 5B, e 12, 1962.

A. Diogoi Hoehne f. *sericeo-villosa* Hoehne, Flora Brasílica 25(2) part. 122: 11, táb. 4. 1940, *nomen nudum.*

A. Diogoi Hoehne f. *subglabrata* Hoehne, Flora Brasílica 25(2) part. 122: 11, táb. 3, 1940, *nomen nudum.*

A. Diogoi Hoehne f. *minor* Hoehne, Flora Brasílica 25(2) part. 122: 12, táb. 5, 1940, *nomen nudum.*

Herba perennis. Radicis ramificationes incrassatae, fusiformes, elongatae. Caulis principalis erectus ramis decumbentibus. Caulis quadrangularis, subglaber usque villosus. Stipulae marginibus basi connatis tubum 4 mm longum efficientes, subglabrae, margine modice ciliatae. Foliola oblongo-lanceolata, rigida, acuta, epiphyllo laevi, praeter aliquot pilos longos in base nervi medii glabro, hypophyllo pilis brevibus adpressis setulisque sparsis immixtis vestito, margine pilis recurvis, caducis.

Hypanthium 2-10 cm longum, villosum. Calyx 6-8 mm longus, villosus, setulae nonnullae adsunt. Vexillum 8-16 mm longum x 15-22 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontale usque ad 50 cm longo, isthmo usque ad 12 cm longo, articulis 8-13 mm longis x 5-7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Campo Grande, Cidade Universitaria, área verde cerca de la piscina, 24-I-1979, Krapovickas & Cristóbal 34340 (CEN). Isotypes: CTES, G, F, K, MBM, MO, NY, P, RB, SI, SP, US.

Erect perennial. Taproot deep with thickened, elongated branches. Mainstem erect, up to 65 cm tall; secondary branches decumbent, up to 35 cm long, arched at the base such that the first nodes are in contact with the soil; tertiary branches up to 29 cm long. Stems with persistent stipules toward the base and densely foliated toward the apex; internodes usually 10-15 mm long but varying between 5 and 27 mm, quadrangular, from subglabrous to villous, especially along the corners. Leaves tetrafoliolate. Stipular sheath that completely envelops the stem, with the margins fused some 4 mm at the base, the remainder with the margins more or less contiguous; with the growth in thickness of the stem, the part with fused margins is broken, leaving the margins necrotic, and the whole sheath separates from the stem forming a very acute angle. Stipular sheath 10-25 mm long, the free part 10-30 mm long, linear-lanceolate, rigid, with prominent longitudinal veins. Petiole usually 10-15 mm long, rarely up to 30 mm, rachis 5-10 mm long. Leaflets oblong-lanceolate, rigid, acute, somewhat asymmetric at the base, mucronulate at the apex; in well-developed leaves the apical pair reaches 60 mm long x 10 mm wide and the basal pair 55 mm long x 8 mm wide; with a length/width ratio of 4.5:1 to 7:1, the first leaves, however, usually have a smaller ratio. Stipules with surfaces subglabrous, with some hairs toward the margin of the sheath; margins somewhat ciliate. Petiole and rachis with the backs subglabrous or with scattered hairs, both canaliculate with villous canal margins. Upper surface of the leaflets smooth, glabrous, with some long hairs at the base of the midvein; lower surface with short, very adpressed hairs, hairs somewhat longer on the midvein and usually with scattered bristles; midvein very marked, margin and secondary veins marked; margin with recurved, caducous hairs. Inflorescences densely clustered at the underground base of the branches and also occur along the length of the stems; floral axis up to 2 cm long below the soil and very short on the aerial parts. Hypanthium of the subterranean flowers 2-4 cm long, that of the aerial flowers up to 10 cm long, villous. Calyx 6-7 mm long, villous and with some bristles, lower lobe falcate, acute, 7-8 mm long. Standard 8-16 mm long x 15-22 mm wide, orange, with yellow basal spot and pink lines on the front. Fruit subterranean, biarticulate; pegs growing horizontally, 2-5 cm deep, up to 50 cm long; isthmus up to 12 cm long; articles 8-13 mm long x 5-7 mm wide, distal article somewhat larger than the basal, up to 18 mm long x 8 mm wide; pericarp smooth; seed with a white seed coat with pink tinge. 2n=20 chromosomes (Mendes 1947 *sub A. Diogoi* f. *typica* no. 84).

Additional material: BRAZIL. **Mato Grosso do Sul.** Campo Grande, 5-VIII-1936, Hoehne & al. (SP 35775, SP 36478); id., 28-V-1939, Otero 457 (RIZ, SP); id., 23-XI-1844, Octacilio 7890 (IAC, SP, UC); id., 23-III-1948, Stephens & al. SH 259 (LIL); id., 22-II-1969, Gregory & al. 9736 (GH, LIL, MO, NY, SI, SP, US); id., 9-VI-1968, Hammons & al. 547 (CTES); id., Valls & al. 11778 (CEN); 7 km S de Campo Grande, 23-II-1959, Gregory & al. 9811 (LIL, NY, SI, US); id., Gregory & al. 9812 (LIL, MO, NY, SI, US); 17 km S de Campo Grande, 3-VII-1977, Krapovickas & al. 30159 (CTES); Imbirussú, 15 km SW de Campo Grande, 30-I-1933, Otero 172 (RIZ, SP); 27-V-1939, Otero 455 (SP); 25-II-1959, Gregory & al. 9820 (LIL, NY, SI, US); Gregory & al. 9821 (GH, LIL, MO, NY, SI, US); Indu Brasil, 18 km S de Campo Grande, 24-II-1959, Gregory & al. 9817 (LIL, NY, US); Fazenda Exper. Criação, 30 km S de Campo Grande, 25-V-1939, Otero 442 (RIZ, SP); Otero 444 (RIZ); Otero 445 (SP); 24-II-1959, Gregory & al. 9814 (LIL, NY, US); Lagoinha, 30 km SE de Campo Grande, 6-IX-1936, Archer & al. 3968 (K, NA, NY, SP);

Anhandui, 60 km S de Campo Grande, 1-III-1959, Gregory & al. s/n (LIL 462183); 59 km W de Campo Grande, camino a Aquidauana, 3-VII-1977, Krapovickas & al. 30155 (CEN, CTES, NY, US); Rodovia Campo Grande-Aquidauana ao longo dos kms 52 a 110, 25-I-1979, Leitao Filho & al. 9306 (UEC); 21 km N de Campo Grande, camino a Cuiabá, 5-III-1950, Gregory & al. 9831 (GH, LIL, MO, NY, US); Campo Grande Fazenda Xarqueada Velha, 3-IX-1936, Archer 3967 (NA, SP); Campo Grande, "amendoim erecto", 9-IX-1936, Archer & al. 138 (K, NA, US); Campo Grande, 3-XII-1943, Baldwin Jr. 3140 (US). Mun. Campo Grande: Antiga Fazenda Modelo do Ministerio da Agricultura, 17-IV-1984, Valls & al. 7614 (CEN, CTES); km 374, da rodovia de Campo Grande a Sidrolandia, 16-IV-1984, Valls & al. 7606 (CEN, CTES). Mun. Terenos: BR-262, acesso a Antiga Fazenda Modelo, 18-IV-1984, Valls & al. 7619 (CEN, CTES); id., 7620 (CEN, CTES). Mun. Jaraguari: Jaraguari, 9-IV-1986, Valls & al. 9941 (CEN, CTES).

Cultivated material: U.S.A. **Florida.** Gainesville, cult., originally from Campo Grande, MS (Archer 138), 7-V-1939, Carver s/n (SP 42275). BRAZIL. **São Paulo.** Campinas, Instituto Agronómico, V.128, originally from the Sec. Agrostologia, km 47, RJ, Conagin 4 (IAC 18131); id., V.128, Conagin 12 (IAC 18669).

Common name. "amendoim do campo limpo" (Otero 1952: 170).

Geographic distribution. This species has been collected in the area around Campo Grande (MS) in an area that extends some 60 km to the west, 60 km to the south and 20 km to the north. It grows in "cerrado," in deep red soils.

Obs: *Arachis Archeri* has been confused with *A. Diogoi* Hoehne, a species likewise with oblong-lanceolate leaflets, but which belongs to the section *Arachis* for its prostrate to semi-prostrate habit, for fruiting only along the length of its branches, and for its failure to cluster its flowers at the collar, as we have been able to verify by collecting it (*A. Diogoi*) in its type locality (Mato Grosso, Lagoa Gaiba).

Among the diverse forms described by Hoehne, it is worth pointing out *A. Diogoi* f. *sericeo-villosa* Hoehne, 1940: 11, tab. 4 (*nomen nudum*), which, although it is very similar to *A. Archeri*, is differentiated by the more abundant and silky tomentum on the stems and stipules and by its leaflets with very short, more or less upright hairs on the upper surface and a villous lower surface.

The material we studied of this variant also came from Campo Grande and its environs: Campo Grande, 24-XII-1932, Otero 1 (SP); Faz. Experimental de Criação, 25-V-1939, Otero 444 (SP), Otero 444 bis (RIZ, SP), 24-II-1959, Gregory & al. 9816 (LIL, US); 48 km N de Campo Grande, camino a Cuiabá, 5-III-1959, Gregory & al. 9835 (GH, LIL, MO, NY, SI, SP, US).

In the experimental crosses, *A. Archeri* produced hybrids with fertility that fluctuated between 17.6 and 40.4% with *A. major* and almost completely sterile hybrids with *A. Hatschbachii*, of its same section, and with *A. Rigonii* of section *Procumbentes*. Because of its oblong-lanceolate leaves, *A. Archeri* is easily distinguished from all of these species and is not sympatric with any of them.

We dedicate this species to W.A. Archer, a scientist with the U.S. Department of Agriculture, who collected it in 1936.

14. *Arachis stenophylla* Krapov. & W.C. Gregory *nov. sp.*
Fig. 1,14

A. angustifolia auct. non (Chodat & Hassl.) Killip ex Hoehne, Hoehne, Flora Brasílica 25 (2) part. 122: 12-13, táb. 6, 1940. Hermann, Agric. Monogr. USDA 19: 8, fig. 3, 1954. Both authors refer to specimen Fiebrig 4277. The type of the taxon of Chodat & Hassler shows rhizomes and for that reason it is treated as a synonym of *A. glabrata*.

A. Diogoi auct. non Hoehne, Burkart, Darwiniana 3(2): 282, 1939. It likewise refers to specimen Fiebrig 4277.

A. Diogoi Hoehne forma *submarginata* Hoehne, Flora Brasílica 25 (2) part. 122: 12, 1940

nomen pro parte (Otero 407).

Herba perennis. Radix profunda, fusiformis, ad medium incrassata, ramificationibus non incrassatis. Rami suberecti usque decumbentes. Caulis villosus. Stipulae pubescentes, dorso villosae et margine pilis longis sericeis ornatae. Foliola lineari-lanceolata, rigida, epiphyllo laevi, glabro, hypophyllo pilis adpressis sparsim vestito, nervo medio margineque prominenti copiose pilis longis sericeis obtectis, nervis secundariis manifestis. Hypanthium 4-10 cm longum pilis sericeis sparsim vestitum. Calyx 8-9 mm longus, pilis longis sericeis obtectus. Vexillum 16 mm longum x 19 mm latum, luteo-aurantiacum. Fructus biarticulatus paxillo horizontali usque ad 50 cm longo, isthmo 2.5-5.5 cm longo, articulis 10-16 mm longis x 7-8 mm latis, apice recurvo, pericarpio nervis modice manifestis.

Holotype: ARGENTINA. Corrientes. Facultad de Ciencias Agrarias, Corrientes, cult., individuos transplantados procedentes de Brasil, Mato Grosso do Sul, 87 km E de Porto Murtinho, BR-34 (leg. Hammons, Langford, Krapovickas & Hemsy 572), 25-II-1969, Krapovickas 15412 (CEN). Isotypes: CTES, G, K, SP, US.

Erect or decumbent perennial. Root deep, fusiform, thickened toward the middle, with unthickened branch roots. Collar with numerous buried compact inflorescences that upon maturity form a dense "mare's tail" of fruits. Branches up to 1 m long, erect or decumbent; stems green, furrowed, somewhat twisted; internodes long, up to 60 mm long, with long, silky hairs. Leaves distichous, tetrafoliolate, on the lower nodes trifoliolate leaves are often present. Stipules with the fused part 20-23 mm long, free part 30-35 mm long x 2 mm wide. Petiole 20-40 mm long, canaliculate; rachis 6-10 mm long. Leaflets linear-lanceolate, stiff, the basal pair somewhat smaller than the apical pair, in well-developed leaves the basal leaflets 45-51 mm long x 4-7 mm wide, and the apical leaflets 55-62 mm long x 7-9 mm wide. Stipules with long, silky hairs on the margin of the free parts and on the back of the fused part, both surfaces of the free parts pubescent; petiole and rachis with long, silky hairs scattered on the back and abundant on the margins of the canal, interior of the canal with scattered short, silky hairs; pulvinus light green, densely pilose; upper surface of the leaflets smooth, glabrous, the lower surface with very prominent midvein and margins and marked secondary veins, the surface scattered with adpressed hairs and with abundant long, silky hairs on the midvein and margin. Reproductive spikes subterranean, very short, 3-flowered, along the length of the stems and also densely clustered at the collar. Flowers in the axils of the bracts, the lower bract pointed, 9 mm long x 3 mm wide, the upper bract 10 mm long x 3 mm wide, 2-veined and split at the apex. Hypanthium 4-10 cm long with scattered, silky hairs. Calyx with long, silky hairs, the larger lobe 8 mm long x 5.5 mm wide, the smaller lobe falcate, 9 mm long x 1 mm wide. Standard 16 mm long x 19 mm wide, up to 24 mm x 30 mm, orange-yellow all over and with soft red lines on the upper surface. Fruit biarticulate. Pegs of various lengths according to the position of the flower, those originating at the collar of the plant up to 50 cm long, and those originating along the branches 7-20 cm long. Basal article 3-15 cm deep, 10-13 mm long x 7-8 mm wide, isthmus 2.5-5.5 cm long, and the apical article 13-16 mm long x 7-8 mm wide, beaked; peg and isthmus covered with small, caducous hairs, epicarp not prominently veined, covered with a dense coat of diminutive hairs. Seed cylindrical, completely filling the article's cavity. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BRAZIL. **Mato Grosso do Sul.** S/l. Campo, G.T. Bertoni s/n (LPS 23126). Mun. Porto Murtinho: 87 km E de Porto Murtinho, camino a Jardim, en campo con palma enana (*Butia* sp.), suelo rojo arcilloso-arenoso, 12-VI-1968, Hammons & al. 572 (CEN, CTES, US); 90 km E de Porto Murtinho, 12-VI-1968, Krapovickas & al. 14442 (CTES); 67 km E de Porto Murtinho, 29-VI-1977, Krapovickas & al. 30136 (CEN, CTES, US); 70 km E de Porto Murtinho 29-VI-1977, Krapovickas & al. 30137 (CTES). Mun. Bela Vista: 7 km E de Bela Vista, 14-II-1959, Gregory & al. 9648 (GH, LIL, MO, NY, US); 7 km E de Bela Vista, 26-IV-1977,

Krapovickas & al. 30126 (CEN, CTES); Bela Vista, 10-V-1939, Otero 407 p.p. (RBR).

PARAGUAY: **Concepción.** Zwischen rio Apa und rio Aquidaban, Centurión, 57°35'W, 22°18'S, 25-XI-1908, Fiebrig 4277 (G, K, SI, US).

Geographic distribution. This species inhabits the northern part of eastern Paraguay and southwestern Mato Grosso do Sul, in a band whose axis is constituted by the Río Apa. It grows in red soils with rocky outcroppings in grasslands with abundant low palms (*Butia*).

Obs. The only hybrids that were obtained with *A. stenophylla* were with *A. Martii* (0.07% pollen fertility) and with *A. paraguariensis* subsp. *paraguariensis* (16.8%).

With its sinuous stems and its roots without enlargements, *A. stenophylla* is very much like *A. paraguariensis*, from which it is distinguished by its linear-lanceolate leaflets.

15a. *Arachis paraguariensis* Chodat & Hassl. subsp. *paraguariensis*

Figs. 1,15a; 4; 14,A-B; Plate II

Chodat & Hassler, Pl. Hassl. 2: 449, 1904, "*in arenosis pr. Tobaty, Sept., n. 6358.*" Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13: 763, 1933.

A. prostrata Benth. var. *intermedia* Chodat & Hassl., Pl. Hassl. 2: 449, 1904, "*in campis humidis pr. Concepción, Sept., n. 7542.*"

A. Diogoi Hoehne forma *submarginata* Hoehne, Flora Brasílica 25(2) part. 122: 12, 1940, *nomen p.p.* (Otero 393, 407 & 409).

Perennial plant. Taproot somewhat fusiform, up to 10 mm in diameter in its thickest part, deep, with branch roots that taper uniformly, without enlargements. Collar with numerous subterranean inflorescences with fertile flowers that form a "mare's tail" of pegs. Stems sinuous. Mainstem erect, lateral branches decumbent, 30-85 cm tall; internodes angular, up to 7 cm long, very short toward the apex of the branches, villous, or with long silky hairs on the angles, or glabrous. Leaves distichous, tetrafoliolate. The fused part of the stipules up to 20 mm long, with margins somewhat imbricated at the base; the free part up to 30 mm long, 2-3 mm wide, very acute. Petioles up to 30 mm long, canaliculate, angular. Rachis ca. 10 mm long. Leaflets oblong-lanceolate, acute, apical pair up to 62 mm long x 21 mm wide, basal pair up to 60 mm long x 14 mm wide. Stipules with surfaces pubescent to subglabrous, long silky hairs on the margins, sometimes with bristles on the fused part; petiole and rachis villous, canaliculate, canal softly pubescent, sometimes with bristles on the back; leaflets with smooth upper surface, glabrous to subglabrous and with the margin somewhat marked, the lower surface with midvein, secondary veins and margins very marked, surface with loose silky hairs, frequently with some bristles, midvein and margins with abundant long, silky hairs. Inflorescences clustered underground on the collar and on the lower nodes, flowers with epigeous corolla that ordinarily produce fruit. There are also aerial flowers along the length of the branches, which only fruit if the branch is decumbent and the flowers occur near the soil. Hypanthium 4.5 to 12 cm long, villous. Calyx bilabiate, 6-11 mm long with silky hairs and some bristles on the outer surface. Standard 14-21 mm long x 16-23 mm wide, entirely orange or orange with a small basal yellow spot and with lightly marked red lines on the upper surface; wings yellow. Fruit biarticulate; pegs 10-75 cm long, growing horizontally; isthmus 2-10 cm long; articles usually 15 mm long x 7 mm wide (up to 17 x 8 mm), pericarp smooth with a dense coat of diminutive hairs and curved apical beak. 2n=20 chromosomes (Smartt 1964, Smartt & Gregory 1967, GKP 9646).

Holotype: PARAGUAY. Dep. Cordillera. Tobaty, IX-1900, Hassler 6358 (G!). Isotype: BM!.

Selected additional material: BRAZIL. **Mato Grosso do Sul.** N del Aquidabán, G.T. Bertoni s/n (LPS 23127). Mun. Miranda: 16 km S of Guaicurus, 56°45'W, 20°10'S, 11-XII-1976, Krapovickas & al. 30013 (CEN, CTES, GH, LIL, MBM, MO, NY, RB, SP, US); 30 km S de Guaicurus, 11-XII-1976, Krapovickas & al. 30014

(CEN, CTES. EAC, GH, IAN, K, MO, NY, SI, SP, US); Estancia Esmeralda, 45 km S de Guaicurus, 11-XII-1976, Krapovickas & al. 30015 (CEN, CTES, G, GH, MO, NY, P, RB, SI, SP, US); 30 km na Serra Bodoquina, 35 km depois da curva P 2 (RADAM), 20-X-1980, Pires & al. 17200 (CTES). Mun. Porto Murtinho: 93 km E de Porto Murtinho, 29-VI-1977, Krapovickas & al. 30142 (CEN, CTES, US). Mun. Jardim: 71 km W de Jardim, 56°48'W, 21°15'S, 480 m, 27-VI-1977, Krapovickas & al. 30133 (CTES, US). Mun. Bela Vista: Bela Vista, 8-V-1939, Otero & al. 393 (SP); Bela Vista, faz. Formosa, 14-V-1939, Otero 407 p.p. (SP); y Otero 409 (SP); Bela Vista, 14-III-1959, Gregory & al. 9646 (CTES, GH, LIL, MO, NY, SI, SP, US).

PARAGUAY. S/l. 6-I-1919, G.T. Bertoni 684 (LPS 23123). **Concepción.** Concepción, XI-1901, Hassler 7542 (G, holotype of *A. prostrata* var. *intermedia* Chod. & Hassler, BM, K, NY); Ñu Porá, 16-V-1961, Gregory & al. 10585 (LIL, MO, NY, US); 31 km E de la unión de rutas 3 y 5, 18-II-1968, Krapovickas & al. 14006 (BAA, CTES, IPA, LL, MBM). **Amambay.** Estancia San Luis, 20 km NW de Pedro Juan Caballero, 13-V-1961, Gregory & al. 10562 (LIL, US); 1 km N del rio Aquidabán, camino de ruta 5 a Bella Vista, 23-VI-1977, Krapovickas & al. 30115 (CTES); 9 km SE de Bella Vista, 24-VI-1977, Krapovickas & al. 30118 (CTES, US); 20 km SE de Bella Vista, 24-VI-1977, Krapovickas & al. 30124 (CTES, US); Colonia Yvypyté, 56°W, 23°S, 20-VIII-1980, Schinini & al. 20470 (CTES); Bella Vista, 19-X-1981, Schinini 21353a (CTES, G, MO); 9 km SE de Bella Vista, 20-X-1981, Schinini 21387 (CTES, G, K, LIL, MO); id., Schinini 21388 (CTES); 12 km SE de Bella Vista, Ea. Primavera, 22-X-1981, Schinini 21516 (CEN, CTES, G, K, LIL, MO, P). **Cordillera.** Tobatí, 24-V-1964, Krapovickas & al. 11462 (AS, C, CTES, F, G, GH, MO,NY, LIL, MBM, P, SI, US); 2 km N de Tobatí, 17-VI-1977, Krapovickas & al. 30110 (CTES); 17 km de Paraguarí, camino a Piribebuy, 6-II-1966, Krapovickas & al. 12456 (CTES, NY, US); 1 km N de ruta 2, camino de Ipacarai a San Bernardino, 17-VI-1977, Krapovickas & al. 30109 (CTES, US). **Paraguarí.** Saltos del Chololó, 57°2'W, 25°33'S, 14-XI-1978, Arbo & al. 1762 (CTES, G, LIL, MO).

Cultivated material: U.S.A. **Florida.** Alva. Adventitious shoots on the end of the pegs, cult. KC 11488, XI-1993, Gregory s/n (CTES 195522).

Geographic distribution. This species grows in SW Mato Grosso do Sul, in Brazil, and in eastern Paraguay, in the basin of the Paraguay River. It is the southernmost taxon of section *Erectoides*. Its range extends from the Serra da Bodoquena, near Guaicurus (MS) to the department of Paraguarí, in Paraguay.

Obs. 1. The specimen Krapovickas & al. 11488 (Paraguay, dep. Cordillera, 2 km de Ruta 2, camino a San Bernardino, 26-IV-1964; CTES, G, MO, NY, US) has broad leaflets and does not correspond to either of the subspecies we recognize. We visited the same locality later and could not find this variant again.

Obs. 2. The subspecies *paraguariensis* and *capibarensis* are difficult to separate using exomorphological characters. We treat them as two distinct taxa because, in addition to having different geographic distributions, the first has a SAT chromosome with differential staining detected in 11 accessions, and in the chromosomes of the second, observed in 5 accessions, this differentiation was not present (Fernández & Krapovickas 1994).

Obs. 3. This taxon occupies a key position for its ability to produce hybrids, both within its section as well as with other sections (Plate II).

In crosses made between plants of the same subspecies from different localities, the fertility of the pollen fluctuated between 24 and 70%. The hybrid with the most closely related species, *A. stenophylla*, gave 16.8% pollen fertility. The hybrids obtained with the other species of section *Erectoides*, such as *A. Benthamii*, *A. gracilis*, *A. major* and *A. Oteroi*, gave very low values of fertility, less than 1.8%, and with *A. Hermannii* less than 4.3%.

This taxon could be crossed with *A. guaranitica* of section *Trierectoides* (1.1%), with *A. Dardani* of section *Heteranthae* (2%), with *A. appressipila* (1.3 to 4.5%) and with *A. Rigonii* (1 to 4.9%), of section

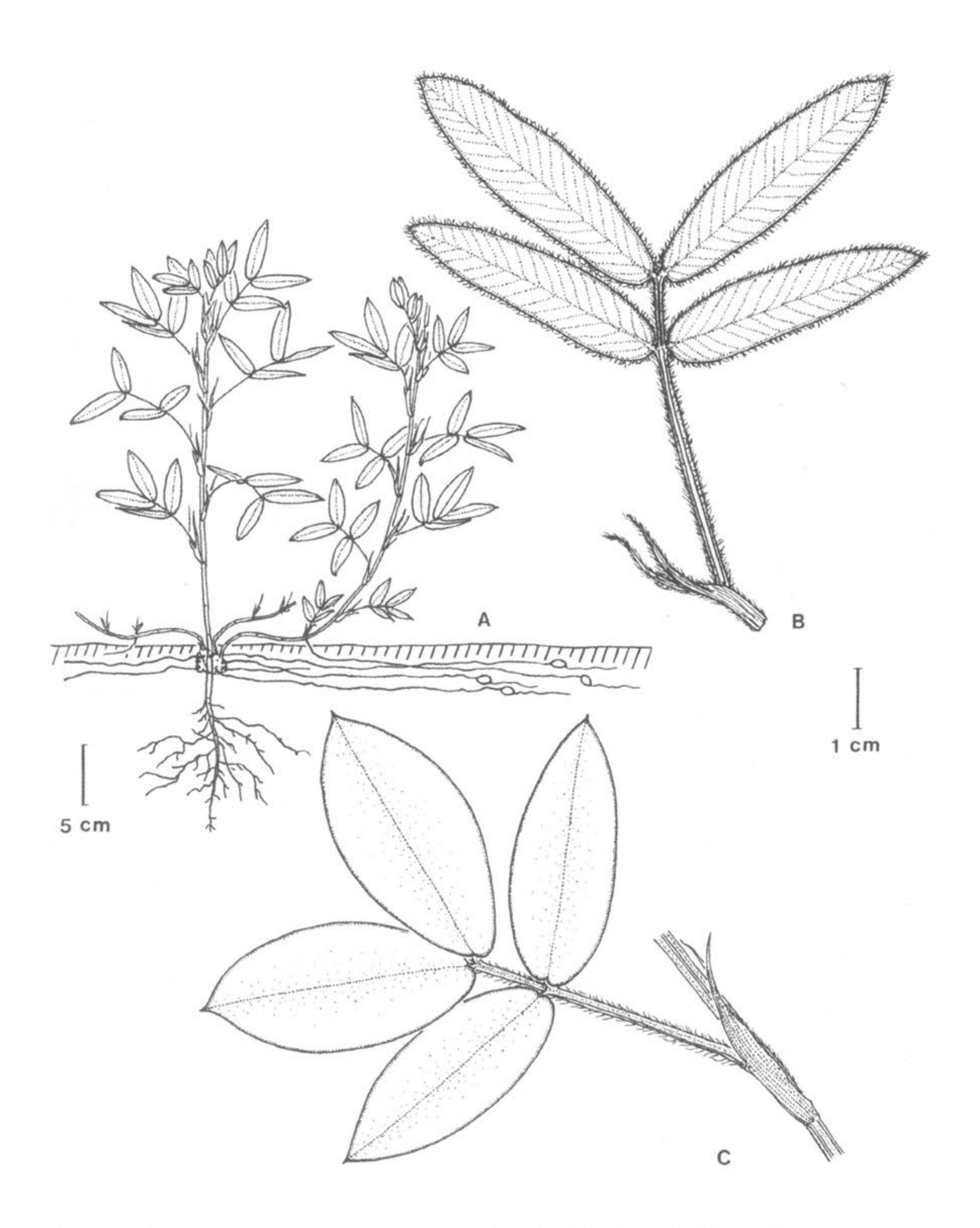


Fig. 14. *Arachis paraguariensis* ssp. *paraguariensis*: A, schematic of the plant; B, leaf (K.11462). *A. paraguariensis* ssp. *capibarensis*: C, leaf (K.30134).

Procumbentes, with *A. repens* and *A. Pintoi* (3.5%) of section *Caulorrhizae* and with *A. glabrata* var. *glabrata* and *A. pseudovillosa*, tetraploid species of section *Rhizomatosae*.

Together with *A. stenophylla*, it forms a group within the section *Erectoides*, being the only ones that grow in the southeast extreme of the range, and which have roots without the thickenings that are so characteristic of the rest of the section.

The two subspecies of *A. paraguariensis*, as well as *A. stenophylla*, all show a blot at no. 7 in the chromatographic profiles (Krapovickas 1973: 139), which is very infrequent and was previously detected only in *A. Archeri* and *A. pseudovillosa* (Seeligmann pers. comm.).

15b. *A. paraguariensis* subsp. *capibarensis* Krapov. & W.C. Gregory *nov. subsp.*

Figs. 1,15b; 14,C

Herba perennis. Radix profunda, leviter fusiformis, ramificationibus tenuibus non incrassates. Caulis principalis erectus ramis decumbentibus. Caules flexuosi, subvillosi. Stipulae dorso pilis longis vestitae, quod superest subglabrum, margine ciliatae. Foliola elliptica, epiphyllo laevi, glabro, hypophyllo villoso, nervis et margine manifestis. Hypanthium 4.5-16 cm longum, villosum. Calyx 7-13 mm longus, pilis sericeis setulisque nonnullis vestitus. Vexillum 15-25 mm longum x 18-27 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali, articulis 10-18 mm longis x 5-8 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Mun. Porto Murtinho, 43 km E de Porto Murtinho, camino a Jardim (cerca del corrego Capibara) en bancos de arena, paisaje chaqueño, 12-VI-1968, Hammons, Langford, Krapovickas & Hemsy 565/566 (CEN). Isotypes: CTES, US.

Perennial plant, erect. Taproot deep, somewhat fusiform, up to 13 mm in diameter at the thickest part, branch roots slender, without enlargements. Branches wavy, internodes short, up to 70 mm toward the base, usually covered by the stipules, especially toward the apex of the branches, angular, from somewhat villous to subglabrous. Leaves tetrafoliolate, distichous. In wild material, the fused part of the stipules 9-17 mm long, the free parts 10-16 mm long x 1.5 mm wide (in cultivated material, the apices up to 28 mm x 3 mm); petiole 22-42 mm long (cult. up to 60 mm), rachis 7 mm long (cult. up to 20 mm); leaflets elliptical, apical pair 25-35 mm long x 10-12 mm wide (cult. up to 75 mm x 24 mm), basal pair 24-31 mm long x 9-10 mm wide (cult. up to 65 mm x 18 mm). Base of the stipules somewhat imbricated, with marked longitudinal veins, base subglabrous or somewhat pubescent, with hairs somewhat longer on the back, apices subfalcate, acute, glabrous with the margin somewhat ciliate. Petiole subglabrous or with scattered silky hairs. Leaflets with upper surface smooth, glabrous, with the margin slightly or not marked, lower surface villous, midvein and secondary veins marked, margin marked with short hairs directed toward the apex. Flowers are clustered toward the base of the plant but also occur along the branches, in very short 4-flowered spikes. Hypanthium 4.5-16 cm long, with silky hairs. Calyx with silky hairs somewhat shorter than those of the hypanthium and with some bristles, upper lobe 7-11 mm long, lower lobe falcate, 8-13 mm long. Standard 15-25 mm long x 18-27 mm wide, yellow in the center with an orange margin. Fruiting clustered at the collar of the plant. Fruits biarticulate, pegs horizontal, articles 10-18 mm long x 5-6 mm wide, epicarp smooth, densely villous when young. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Porto Murtinho: 44 km E de Porto Murtinho, BR-267, corrego Capibara, bosque abierto de *Schinopsis*, 150 m, 29-VI-1977, Krapovickas & al. 30134 (CEN, CTES, US); 64 km E de Porto Murtinho, 12-VI-1968, Hammons & al. 570 (CEN, CTES, US); 82 km E de Porto Murtinho, 240 m, 29-VI-1977, Krapovickas & al. 30139 (CTES, US); 83 km E de Porto Murtinho, 29-VI-1977, Krapovickas & al. 30141 (CTES); 108 km E de Porto Murtinho, 12-VI-1968, Hammons & al. 573 (CEN, CTES); Faz. Congonha, P7 (RADAM), 22-X-1980, Pires & al. 17238 (CTES).

Geographic distribution. This species was collected on the western foothills of the Sierra de Bodoquena, in the southwestern extreme of Mato Grosso do Sul, all along the route from Jardim to Porto Murtinho. The westernmost collections were made at the border of a small area of "chaco" which enters into Brazil, with the "cerrado." There, it grows in an open forest of *Schinopsis*, in shallow, light sandy soil. The remainder of the collections were made in red soils with rocky outcrops in savannas with an abundance of low palms of the genus *Butia.*

III. *Sect. Extranervosae* Krapov. & W.C. Gregory *nov. sect.*

Fig. 5

Sect. Extranervosae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 93, 1973. Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973, *nomen nudum.*

Perennes. Radices ramificationibus tubercularibus, concatenatis. Stipulae marginibus liberis usque ad basem. Folia quadrifoliolata epiphyllo viridi, nitido. Vexillum aurantiacum subtus lineis rubescentibus ornatum. Fructus subterraneus, biarticulatus paxillo fere horizontali, paulo profundo, saepe radicante, pericarpio fere laevi.

Typus sectionis: *Arachis prostrata* Benth.

Perennial plants. Roots with tuberiform thickenings, frequently concatenated. Mainstem erect and branches procumbent. Stipules with the margin free to the base. Leaves tetrafoliolate, upper surface bright green, shiny. Flowers small to medium-sized, along the length of the branches. Hypanthium ca. 4 cm long. Standard orange or yellow, with red lines on the back. Fruit subterranean, biarticulate; peg, frequently with adventitious roots, short, almost vertical or some 20 cm long, horizontal; isthmus short; articles smooth, covered with a dense layer of hairs. 2n=20 chromosomes.

Geographic distribution. All the species of this section live in an area that includes the states of Goiás, Tocantins, the central part of Mato Grosso and the northern part of the Mining Triangle in Minas Gerais. A few species extend beyond the limits of those states, such as *A. prostrata* which was also collected in the west of Bahia and *A. Burchellii* which also lives in the south of Maranhão, in the southeast of Pará and in the vicinity of Teresina, in Piauí.

It has not been possible to establish the area of origin of *A. villosulicarpa*, which is only known as cultivated by indigenous groups of west-central Mato Grosso.

With the exception of *A. villosulicarpa*, none of the wild species was collected west of the Paraguay River, which from its source constitutes the western limit of the section *Extranervosae*.

The majority of the species in this section grow on a very special soil type, frequently encountered in the "cerrado," constituted by a thin layer of soil over a stony substrate.

Obs. The pollen grains of *A. prostrata*, *A. lutescens* (Pire 1968) and *A. villosulicarpa* (Pire 1974) are tricolpate and syncolpate, that is, with the colpi united at the poles, similar to those of the genus *Stylosanthes*, in contrast to the rest of the genus *Arachis* where the colpi are isolated.

Key for distinguishing the species

A. Leaflets 3-4 times longer than wide, upper surface glabrous, lower surface with bristles on the marginal veins.

16. *A. setinervosa*

A'. Leaflets less than 3 times longer than wide; bristles, if present, are perpendicular to the margin, not on the veins.

B. Upper leaf surface completely glabrous.

C. Leaflets two or more times longer than wide. Fruit articles 10-15 mm long x 6-7 mm wide.

17. *A. Macedoi*

C'. Leaflets less than 1.6 times longer than wide.

D. Plants erect. Leaflets with thickened margins, ca. 40 mm long x 25 mm wide. Fruit articles 14-16 mm long x 5-8 mm wide.

18. *A. marginata*

D'. Branches prostrate. Leaflets with the margin unmarked, less than 20 mm long. Fruit articles less than 9 mm long x 6 mm wide.

E. On the prostrate branches, leaflets oblong or elliptical to obovate-ovate (L/W 1.4-1.8:1).

F. Fruit pegs with adventitious roots. Leaflets elliptical to obovate-ovate (L/W 1.4-1.5:1).

19. *A. prostrata*

F'. Pegs without adventitious roots. Leaflets oblong to obovate-ovate (L/W 1.6-1.8:1).

20. *A. lutescens*

E'. Leaflets suborbicular (L/W 1.0:1). Fruit pegs with adventitious roots.

21. *A. retusa*

B'. Upper leaf surface pilose, at least on the young leaves.

G. Primary branches ca. 5 cm tall. Lateral branches prostrate with leaflets up to 13 mm long x 10 mm wide. Fruit articles less than 11 x 7 mm.

22. *A. Burchellii*

G'. Primary branches more than 40 cm long.

H. Fruit articles 8 mm long x 5 mm wide. On the lateral branches, leaflets from 12-23 mm long x 5-10 mm wide.

23. *A. Pietrarellii*

H'. Fruit articles 16-23 mm long x 8-10 mm wide. Leaflets 16-44 mm long x 5-16 mm wide.

24. *A. villosulicarpa*

16. *Arachis setinervosa* Krapov. & W.C. Gregory *nov. sp.*

Herba perennis. Radix palaris, tuberosa. Rami prostrati, ca. 20 cm longi, brachyblastos gerentes. Caulis pilis rigidis 2 mm longis villosus. Stipulae violaceae, villosae. Foliola oblongo-lanceolata, rigida, epiphyllo laevi, glabro, viridi, nitido, hypophyllo pilis longis sparsim vestito, nervo medio et margine prominentibus, saepe setulis brevibus, crassis, patentibus margine instructo. Hypanthium 2.5-4 cm longum, violaceum. Calyx 5-6 mm longus, villosus, sine setulis. Vexillum 8-10 mm longum, luteum subtus lineis rubescentibus ornatum.

Holotype: BRAZIL. Mato Grosso. Mun. Barra do Garças, crest of Serra do Roncador, along new road, 127 km NNE of village of Xavantina, 29.9 km S of crossing of Corrego Tanguru. Herb carpet on laterite pebble substrate on a gentle slope otherwise covered with scrub cerrado. Main herb forming the carpet. 13-XII-1969, Eiten & Eiten 9904 (US). Isotypes: NY, K.

Perennial plant. Taproot with tuberiform enlargements of some 7 mm in diameter. Branches prostrate, ca. 20 cm long. Stem angular, internodes 10-15 mm long, purplish, villous, with hairs 2 mm long, more or less rigid and perpendicular to the surface of the

stem. The main branches with very short ramifications or spurs 10-15 mm long with internodes almost non-existent and leaves densely clustered. Stipules with the fused portion 3 mm long and the free apices 5-10 mm long x 1 mm wide at the base. Petiole 5-8 mm long; rachis 2-3 mm long. Apical pair of leaflets somewhat larger than the basal pair; leaflets oblong-lanceolate, the apical 10-14 mm long x 3 mm wide and the basal 8-12 mm long x 2.5 mm wide; leaves somewhat smaller toward the apex of the branches. Basal part of the stipules with prominent longitudinal veins, purplish, or with the violet color limited to the veins, villous, hairs 2 mm long; free portion slender, almost acicular, rigid, with scarce long hairs, more dense on the margin, the latter usually with violet tinge. Petiole and rachis purplish, canaliculate, canal narrow, back with prominent veins, villous, hairs similar to those of the stem and also with short adpressed hairs. Pulvinus villous. Leaflets rigid, upper surface glabrous, smooth, brilliant green; lower surface with scattered long hairs, midvein and marginal veins prominent, marginal veins with short thick bristles, most of the time perpendicular to the underside. Inflorescences few-flowered, axillary, arranged along the length of the branches. Flowers with basal bracts 5 mm long, villous. Hypanthium 25-40 mm long, lilac colored, villous with long sparse hairs which retain grains of sand. Calyx bilabiate, 5-6 mm long, villous, without bristles, lobes united at the base 1.5-2 mm. Standard 8-10 mm long, yellow, with red lines on the back surface.

Additional material: BRAZIL. **Mato Grosso.** Mun. Agua Boa: 26,5 km N do acesso principal a Agua Boa ao longo da BR-158, 117 km N de Nova Xavantina, 12°16'S, 8°6'W, 360 m, Valls & al. 12516 (CEN, CTES).

Geographic distribution. This species is known only from the high parts of the Serra do Roncador, the vegetation of which was studied by Eiten (1975), supplying interesting details on the habitat of this species (page 120). According to Valls (12516), it occurs in sandy soil over a layer of laterite rocks, under a vegetation dominated by *Diectomis fastigiata* (Swartz) Kunth, an annual grass that is easily burned. If this occurs, the rocky hillside is left covered by *Arachis setinervosa.*

Obs. *Arachis setinervosa* is characterized by the presence of bristles on the marginal veins on the back of the leaflets. When there are bristles present in other species of *Arachis*, these are on the margin itself and grow in the same plane as the surfaces of the leaflets, and not perpendicularly as is the case in *A. setinervosa.*

It is very difficult to determine the presence of red lines on the dorsal surface of the standard in the dry material, but the analysis of the flowers of the type specimen leaves little doubt of their existence. By its other characteristics, it approaches several of the species of the section *Extranervosae.* By the form of the leaflets, oblong-lanceolate, it approaches *A. Macedoi*, from which it is differentiated by the spur branches that give *A. setinervosa* a unique appearance.

17. *Arachis Macedoi* Krapov. & W.C. Gregory *nov. sp.*

Figs. 1,17; 15,C-E

A. Macedoi Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 120, 1973, *nomen nudum.* Refers to specimen GKP 10127.

Herba perennis. Radix palaris ramificationibus tubercularibus. Caules principalis erectus ramis procumbentibus. Caulis pilis longis sericeis, sparsim vestitus. Stipulae plerumque glabrae, pili longi in dorso interdum adsunt. Foliola ovaliter-lanceolata epiphyllo laevi, viridi, nitido, glabro, hypophyllo glabro vel pilis brevibus, adpressis, sparsim vestito, nervo medio prominente longos pilos caducos gerente, margine ciliato paulo manifesto. Hypanthium 2-6 cm longum, villosum. Calyx 5-7 mm longus pilis ca. 2 mm longis vestitus. Vexillum 7-9 mm longum x 8-10 mm latum, aurantiacum, dorso lineis rubescentibus ornatum. Fructus biarticulatus paxillo horizontali usque ad 20 cm longo, radices adventitias emittenti, isthmo 6 mm longo, articulis 10-15 mm longis x 6-7 mm latis, apice recurvo, pericarpio laevi.

Holotype: BRAZIL. Minas Gerais. Capinópolis, Fazenda Santa Terezinha, margen inundable de pequeña laguna, suelo pedregoso, 4-IV-1961, Gregory, Krapovickas & Pietrarelli 10127 (LIL). Isotypes: CEN, CTES, G, GH, MO, NY, SP, US.

Perennial plant, without rhizomes. Taproot with tuberiform enlargements, also present on the lateral branch roots. Mainstem erect, up to 45 cm tall, lateral branches procumbent, some 50 cm long; stems purple, cylindrical toward the base, quadrangular toward the apex, with scattered long silky hairs; internodes 3-6 cm long. Leaves tetrafoliolate. On the mainstem the fused portion of the stipules 11 mm long x 8 mm wide, the free parts acute, 18 mm long x 2 mm wide; petiole some 40 mm long; rachis 10 mm long; the apical pair of leaflets up to 40 mm long x 10 mm wide, the basal pair 35 mm long x 9 mm wide. Leaves of the lateral branches smaller; basal portion of the stipules 5 mm long x 4 mm wide, the free parts acute, 8 mm long; petiole 10 mm long; rachis 4 mm long; the apical pair of leaflets 13 mm long x 5 mm wide, basal pair 12 mm long x 5 mm wide. Stipules with glabrous surfaces, occasional long hairs on the back and toward the base of the fused portion. Petiole and rachis from villous to glabrescent; pulvinus villous. Leaflets oval-lanceolate; upper surface glabrous, shiny green; lower surface glabrous or with very sparse, diminutive, adpressed hairs, midvein prominent with long, sparse, caducous hairs; margin somewhat marked on the lower surface, with long sparse cilia. Spikes 3-flowered, with very short axis, disposed all along the lateral branches. Flowers with two basal bracts, the lower one acute and entire, the upper one bifid, both with long hairs on the margin and along the midvein. Hypanthium 4 cm long (2-6 cm), villous. Calyx bilabiate, covered with long silky hairs ca. 2 mm long; the broad lobe some 5 mm long, slightly divided at the apex; the narrow lobe subfalcate, 6-7 mm long. Standard 7-9 mm long x 8-10 mm wide, orange, in dry state lilac-violet in the center, with red lines on the back side; wings ca. 5 mm long. Fruit biarticulate; peg horizontal, up to 20 cm long, frequently with adventitious roots; isthmus 0.6 cm long; articles rounded, 10-15 mm long x 6-7 mm wide, pericarp smooth and with beak. 2n=20 chromosomes (Conagin 1964, fig. 1, F, V.776, GKP 10127).

Selected additional material: BRAZIL. **Minas Gerais.** Mun. Ituiutaba: Fazenda do Poço, 30-XI-1944, Macedo 598 (RB 55357, US); Faz. Santa Terezinha, beira da lagoa, lugares humidos, 9-II-1949, Macedo 1636 (SP, US); id., 1671 (SP); Capinopolis, Faz. Santa Terezinha, 22-XI-1971, Macedo 5059 (MBM); id., 23-II-1984, Valls & al. 7533 (CEN, CTES). **Goiás.** Km 31 da Rod. Itumbiara-Rio Verde, 19-IV-1978, Tamashiro & al. 7413 (UEC).

Related material: BRAZIL. **Maranhão.** BR-230, 12 km de Carolina, 14-XI-1979, Martins & al. 7415 (CTES); 11,8 km E de Carolina, 13-III-1982, Valls & al. 6609 (CEN, CTES); 11 km E de Carolina, 13-III-1982, Valls & al. 6610 (CEN, CTES); 5 km E de Carolina, 15-III-1982, Valls & al. 6612 (CEN, CTES); 38 km E de Carolina, BR-230, 18-III-1985, Valls & al. 8383 (CEN, CTES). **Tocantins.** 16 km W de Filadelfia, na estrada para Araguaina, 13-III-1982, Valls & al. 6626 (CEN, CTES). **Goiás.** 20 km NE de Campos Belos na estrada para Aurora do Norte, 12-IV-1986, Valls & al. 9952 (CEN, CTES); 13 km NW de Nova Roma, camino a Teresina de Goiás, 600 m, 3-II-1990, Arbo & al. 3556 (CTES).

Common name. "amendoim do resfriado" (Macedo 598).

Geographic distribution. This species grows in small temporary ponds in rocky soil, in the upper part of the rocky hills in the northern part of Triangulo Mineiro (MG). It was also collected in the vicinity of the Paranaiba River, in the south of Goiás.

Obs. 1. In the more northern collections made near Carolina, in the state of Maranhão, and at Filadelfia, in Tocantins, the material is very similar to *A. Macedoi,* so we tentatively place these under this name. It is possible they pertain to another taxon, but the available material does not allow us to arrive at a more definitive conclusion.

Obs. 2. The specimen Macedo 598 (RB) consists of two plants, one very similar to the type and the other with wider leaflets (the

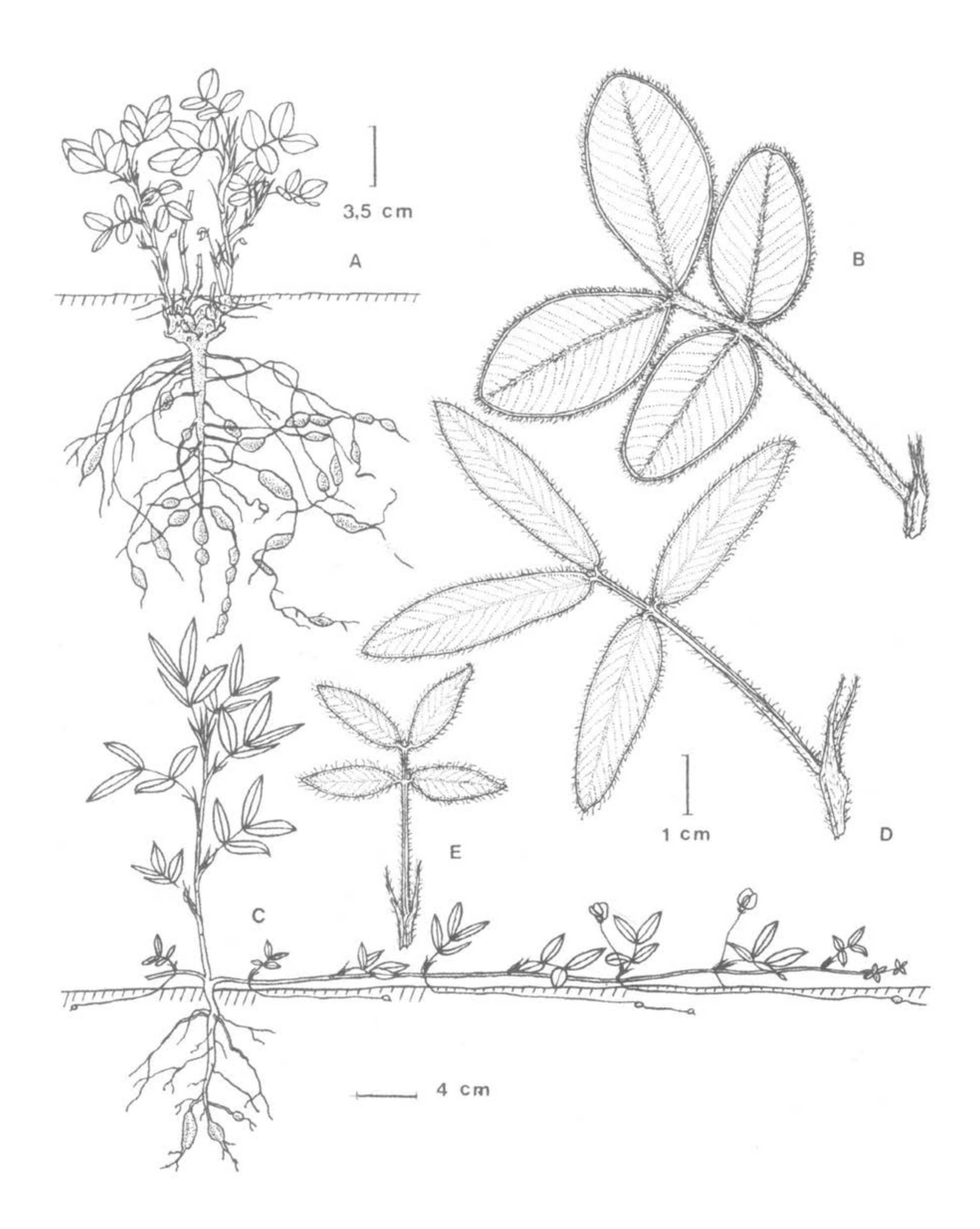


Fig. 15. *Arachis marginata*: A, schematic of the plant; B, leaf, lower side (G.10406). *A. Macedoi*: C, schematic of the plant; D, leaf from mainstem; E, leaf from lateral branch (G.10127).

apical pair up to 32 mm x 18 mm, the basal pair up to 27 mm x 15 mm).

We dedicate this species to Prof. Amaro Macedo of Ituiutaba, Minas Gerais, who collected it for the first time.

18. *Arachis marginata* Gardner

Figs. 1,18; 15,A-B

Gardner, in Hooker, Icon. Pl. 5, tab. 500, 1842, "Herb. Bras. n. 3103. Rare in upland sandy Campos near the mission of Duro, province of Goyaz, Brazil."

Erect perennial. Main taproot with numerous branches bearing concatenate tuberiform enlargements 10-25 mm long x 5-7 mm wide, rugose and more or less striated. Stems erect, up to 10 cm long, unbranched, borne from the collar of the plant; internodes 12-30 mm long, 4-angled, villous, with caducous hairs. Leaves tetrafoliolate. The fused portion of the stipules 7 mm long x 5 mm wide, the free points acute, up to 13 mm long. Petiole very short in the basal leaves, some 2 mm long, and up to 30 mm long in the apical leaves. Rachis 7-12 mm long. Leaflets oblong or obovate, the apical pair up to 42 mm long x 27 mm wide, the basal pair up to 34 mm long x 23 mm wide. Stipules villous on the fused portion, almost glabrous and with prominent veins on the free tips; margin with long dense silky hairs. Petiole and rachis canaliculate, villous on the back. Upper surface of the leaflets glabrous, bright green, smooth and with a line of long hairs on the midvein; the lower surface with prominently marked veins, forming a network, covered with long scattered, adpressed hairs and with longer, rigid and more dense hairs along the midvein; margin strongly thickened on the lower surface of the leaflets, with long dense silky hairs and some short bristles. Inflorescences 3-flowered, axis very short, covered by the stipules, occurring on the basal nodes of the stems. Hypanthium 4 cm long, villous. Standard completely yellow, with reddish lines slightly marked on the back. Fruit subterranean, with articles 14-16 mm long x 5-8 mm wide, with smooth pericarp.

Holotype: BRAZIL. Goiás [Tocantins]. Sandy hill Mission of Duro. oct. 1839, Gardner 3103 (BM!). Isotype: P!.

Additional material: BRAZIL. **Tocantins.** 30 km E de Dianópolis (present name of the Mission of Duro), 22-IV-1961, Gregory & al. 10406 (CTES, LIL). Mun. Dianópolis: Fazenda Agua Limpa 11°37'S, 46°36'W, 17-III-1982, Valls & al. 6649 (CEN, CTES); id., 4-V-1982, Valls & al. 6759 (CEN, CTES). Mun. Ponte Alta do Bom Jesus: 54 km S de Dianópolis e 14 km leste do entroncamento para Taguatinga, estrada Dianópolis-Barreiras, 17-III-1982, Valls & al. 6652 (CEN, CTES).

Geographic distribution. This species is from a very restricted area in the vicinity of Dianópolis (Mision de Duro), where it grows in the "cerrado" with sparse herbaceous vegetation, in white and reddish sandy soils.

Obs. At present, *Arachis marginata* is known only from the type locality and areas very nearby. Nevertheless, its name has been applied to different species which also have much-thickened leaflet margins, as in the case of *A. Burkartii* and of *A. Oteroi* (Bentham 1859: 87). These two species have red lines on the front surface of the standard, the first has rhizomes and neither has roots with the tuberiform concatenate thickenings so characteristic of *A. marginata*.

19. *Arachis prostrata* Benth.

Figs. 1,19; 16,A-C

Bentham, Trans. Linn. Soc. London 18(2): 159, 1841, *"Ad Trahiras provinciae Goyaz Brasiliae. Pohl (v.s. cum fl. comm. a Mus. Caes. Reg. Vind.)."* Bentham, Martius, Fl. bras. 15(1): 87, 1859.

Perennial plant. Main root and its branches with tuberiform enlargements from 9 mm long x 5 mm wide, up to 35 mm long x 7 mm wide. Primary stem erect, 5-12 cm long, covered almost entirely by the stipules, internodes short, ca. 5 mm long, villous. Lateral branches prostrate, up to 90 cm long, stems villous

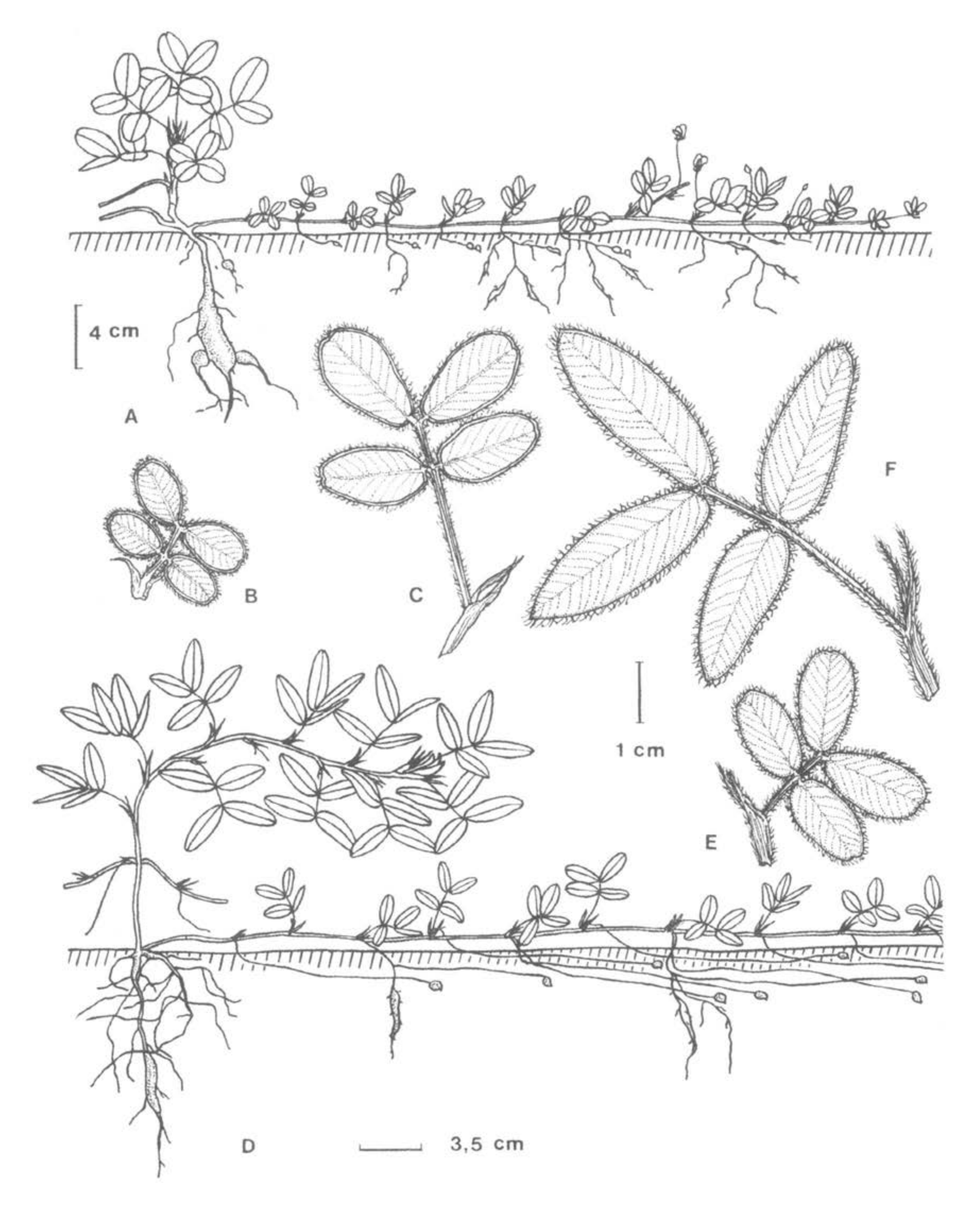


Fig. 16. *Arachis prostrata*: A, schematic of the plant; B, leaf from lateral branch; C, leaf from mainstem (G.10240). *A. Pietrarellii*: D, schematic of the plant; E, leaf from lateral branch; F, leaf from mainstem (G.9923).

toward the apex of the branches and glabrescent toward the base, internodes 10-30 cm long. Leaves tetrafoliolate. On the erect primary branches, stipules with the fused portion some 8 mm long, the free parts 10-12 mm long x 2 mm wide at the base. Petiole 10-

25 mm long. Leaflets oblong, at times somewhat obovate, the apical pair up to 20 mm long x 12 mm wide, the basal pair somewhat smaller, up to 19 mm long x 11 mm wide; rachis 5-10 mm long. On the prostrate lateral branches, the fused portion of the stipules 3-4 mm long, the free portion 5-9 mm long x 2-2.5 mm wide at the base, becoming abruptly acute; petiole 3-5 mm long; leaflets obovate or elliptical, the apical pair usually 9 mm long x 7 mm wide, up to 13 mm x 9 mm, the basal pair being somewhat smaller, up to 12 mm long x 8 mm wide. Stipules villous toward the base and usually with the surfaces of the apices subglabrous and the margin villous, hairs 1.5-2 mm long; petiole and rachis with villous back and ventral surface canaliculate, glabrous. Upper surface of leaflets completely glabrous, shiny, smooth; lower surface densely villous with long, more or less adpressed hairs; margin somewhat marked on the back, longly ciliate, rarely with short bristles. Flowers along the length of the prostrate branches, in short axillary spikes. Hypanthium 2.5-4 mm long, villous. Calyx villous without bristles; lower lobe subfalcate, 5 mm long, upper lobe 4 mm long. Standard 8 mm long x 9-10 mm wide, orange with red-violet lines on the dorsal surface; wings yellow, 5 mm long. Fruit subterranean, biarticulate; peg 1-5 cm long, aerial portion violet and glabrous, densely pubescent below ground, and with abundant adventitious roots which present tuberiform enlargements; isthmus very short; articles independent, rarely united forming a single 2-seeded cavity, 5-8 mm long x 4-5 mm wide, with a short beak; pericarp smooth, densely covered with a layer of small hairs. Seed 4-6 mm long x 3-4 mm wide. 2n=20 chromosomes (Conagin 1963, V.780, GKP 10234).

Holotype: BRAZIL. Goiás. Trahiras [Niquelandia], Pohl 1836 (K!).

Selected additional material: BRAZIL. **Bahia.** Mun. Riachão das Neves: 12 km N de Riachão das Neves, 11°39'S, 44°55'W, 1-IV-1983, Valls & al. 7058 (CEN, CTES, MO, US); 3 km S do entroncamento para Santa Rita, na estrada de Barreiras a Corrente, 11°21'S, 44°56'W, 1-IV-1983, Valls & al. 7?68 (CEN, CTES). **Goiás.** 10 km S del rio Traíras, camino de Niquelandia a Maranhão, 12-IV-1961, Gregory & al. 10234 (BAA, CTES, GH, LIL, MO, NY,US); 3 km S del rio Maranhão, camino Niquelandia-Anapolis, 12-IV-1961, Gregory & al. 10240 (CTES, GH, LIL, MBM, MO, NY, US); 75 km N de Corumbá de Goiás, on road to Niquelandia in valley of rio Maranhão, 700 m, 23-I-1968, Irwin & al. 19055 (NY, RB, UB, US); id., 25-I-1968, Irwin & al. 19196 (K, NY, RB, UB, US); 14 km S de Niquelandia, 21-I-1972, Irwin & al. 34701 (K, NY, UB); Serra do rio Preto, 16°S, 47°W, ca. 8 km E de Cabeceiras, 1000 m, 18-XI-1965, Irwin & al. 10469 (NY, RB, UB, US); 86 km NE de Formosa, camino Brasilia-Barreiras, 19-IV-1961, Gregory & al. 10292 (CTES, LIL, US); 115 km NE de Formosa, camino Brasilia-Barreiras, 25-IV-1961, Gregory & al. 10449 (CTES, G, GH, LIL, MO NY, US); km 194, rod. Belem-Brasilia (mun. Pirenópolis), 30-I-1976, Hatschbach & al. 38197 (CTES, MBM); Rod. BR-020, rio Macacos (mun. Alvorada do Norte), 9-I-1977, Hatschbach 39383 (CTES, MBM). Mun. Flores de Goiás: 4 km N do rio Extrema, BR-020, 14°56'S, 46°59'W, 27-III-1981, Valls & al. 6284 (CEN, CTES); id., 21-III-1982, Valls & al. 6667 (CEN, CTES, NY, US). Mun. Campinorte: 5 km N de Campinorte, BR-153, km 273,2, 14°75'S, 49°9'W, 3-III-1982, Valls & al. 6475 (CEN, CTES, LIL, NY, US). Mun. Porangatu: BR-153, km 384, corrego Funil, 3-III-1982, Valls & al. 6485 (CEN, CTES, G, MO, NY, SI, US). Mun. Alvorada do Norte: 14°33'S, 46°33'W, 21-III-1982, Valls & al. 6662 (CEN, CTES, MO, NY, US); id., 9-V-1982, Valls & al. 6788 (CEN, CTES). Mun. Formosa: 17 km N da vila JK, BR-020, 15°4'S, 47°5'W, 29-III-1983, Valls & al. 7004 (CEN, CTES); 8 km W of Monte Alegre, 600-700 m, 11-III-1973, Anderson & al. 6847 (UB). Mun. Campos Belos: 13,5 km NW de Campos Belos na estrada a Arraias, 2-XI-1984, Allem & al. 3070 (CEN, CTES); 84 km NE de Formosa, BR-020, 2-II-1990, Arbo & al. 3485 (CTES, HRCB); 3 km SW de Posse, GO-446, 3-II-1990, Arbo & al. 3515 (CTES, HRCB); 9 km NE de Iaciara, camino a Posse, 3-II-1990, Arbo & al. 3537 (CTES, HRCB); 4 km SW de Nova Roma, camino a Teresina de Goiás, 3-II-1990, Arbo & al. 3555 (CTES, HRCB); 5 km W de Colinas, camino a Niquelandia, 4-II-1990, Arbo & al. 3665, 3669 (CTES, HRCB); 52 km a leste de São Miguel do Araguaia na estrada para Porangatu, 28-VIII-1984, Valls & al. 7887 (CEN, CTES); 5,2 km N de Campinorte, BR-153, 30-VIII-1984, Valls & al. 7895 (CEN, CTES); Rio Traíras, 10 km W de Niquelandia, 30-VIII-1984, Valls & al. 7897 (CEN, CTES); 5 km N de Campinorte, BR-153, 14-III-

1985, Valls & al. 8304 (CEN, CTES). Mun. Porangatú: corrego Funil, BR-153, km 831, 14-III-1985, Valls & al. 8308 (CEN, CTES); 11,5 km NE de Vale Verde e cerca de 18 km a SW de São Raimundo, 19-III-1985, Valls & al. 8418 (CEN, CTES); 4 km SW de Acreuna, BR-060, 2-IV-1986, Valls & al. 9858 (CEN, CTES); Cachoeira Grande, 27-I-1968, Onishi & al. s/n (NY, SI, UB). **Piauí.** Mun. Altos: 18 km NE de Altos, BR-343, 23-III-1985, Valls & al. 8481 (CEN, CTES); id., Valls & al. 8482 (CEN, CTES). Mun. Campo Maior: 10 km NE de Campo Maior, 23-III-1985, Valls & al. 8486 (CEN, CTES). Mun. Piripiri: 3 km SW do Rio dos Matos, BR-343, 30-IV-1987, Valls & al. 11028 (CEN, CTES). **Tocantins.** 26 km SE do rio Santa Teresa, estrada Gurupí-Peixe, 12°S, 48°37'W, 5-III-1982, Valls & al. 6522 (CEN, CTES, NY, US). Mun. Porto Nacional: barranca do rio Tocantins, 16-III-1982, Valls & al. 6638 (CEN, CTES, NY, US); id., Coradin 3736 (CEN). Mun. Ponte Alta do B. Jesus: fazenda Morro Branco, a 6 km de estrada de Dianópolis a Taguatinga, na estrada para fazenda Agua Limpa, 17-III-1982, Valls & al. 6648 (CEN, CTES, NY, US); Natividade, open sandy places, dec. 1839, Gardner 3104 (G, K, P); Montevidiu, 5-10 km na rodovia para Palmeirópolis, 23-I-1992, Hatschbach & al. 56351 (CTES, MBM). **Minas Gerais.** Mun. Capinopolis: 2 km S de Cachoeira Dourada, 11-VIII-1984, Valls & al. 7725 (CEN, CTES).

Related material: BRAZIL. **Minas Gerais.** Mun. Araguari: Fazenda Piçarrão, declive acima da area de inundaçao do ribeirão Piçarrão, Werneck 3 (CEN, CTES); id., 25-II-1981, Valls & al. 5913 (CEN, CTES); id., 24-II-1984, Valls & al. 7539 (CEN, CTES).

Geographic distribution. *Arachis prostrata* is a species that grows in eastern Goiás, in the south east of Tocantins, in the north of Bahia, in Piauí, and in the north of the Triangulo Mineiro, in compact clayey soils subject to flooding, frequently with gravel, and preferentially near streams of water.

Obs. 1. We collected *A. prostrata* near the type locality where, apparently, only this species of *Arachis* grows. The material coincides very well with the holotype and in the field we were able to confirm the presence of abundant adventitious roots on the pegs. We also observed this detail in all of the other collections we made of this species.

In *A. villosulicarpa* and in *A. Pietrarellii* we have also observed adventitious roots on the pegs, but not with the frequency in which they are present in *A. prostrata.*

The species closest to *A. prostrata* is *A. lutescens*, from which is differentiated by the absence, in the latter, of roots on the pegs, as we were able to confirm in the numerous collections that we would make. Furthermore, *A. lutescens* prefers gravelly soil and occurs to the west and south of the range of *A. prostrata.*

Obs. 2. The material from Faz. Piçarrão, Araguari (MG) (Werneck 3, Valls 5913 & 7539) has an appearance very similar to *A. prostrata* in the size and the shape of the leaves, but has a pilose upper leaf surface like *A. Burchellii* and the pegs have no adventitious roots, as in *A. lutescens.* This material was collected in the extreme southeast of the range of section *Extranervosae* and could correspond to another entity, but it would be advisable to study new populations to decide on the position of this material.

20. *Arachis lutescens* Krapov. & Rigoni

Fig. 1,20

Krapovickas & Rigoni, Darwiniana 11(3): 452-454, lám. 2, abajo, 1957.

Perennial plant. Main root and branches with elongated tuberiform enlargements, from 10 mm long x 5 mm wide up to 80 mm long x 10 mm wide. Aerial part covered with long soft hairs, except the upper side of the leaflets, which is glabrous. Mainstem erect, 3-10 cm long with leaves larger than those of the branches. Lateral branches procumbent, up to 60 cm long; internodes 1-2.5 cm long, villous. Leaves tetrafoliolate, rarely with a supernumerary apical leaflet. On the erect primary axes, stipules with the fused portion from 6-8 mm long, the free parts 10-16 mm long x 2 mm wide at the base, abruptly narrowing; petiole 15-45 mm long; leaflets from oblong to subovate, the apical pair usually 15 mm long x 8 mm wide but up to 24 mm x 13 mm, the basal pair somewhat smaller, up to 23 mm long x 10 mm wide; rachis 5-7 mm long but

up to 13 mm. On the lateral branches, the fused portion of the stipules 3 mm long, the free portion 7 mm long x 2 mm wide at the base, abruptly pointed; petiole 2-6 mm long; from leaflets oblong to obovate, apical pair usually 8 mm long x 6 mm wide but up to 18 mm x 11 mm, the basal pair somewhat smaller, up to 16 mm x 9 mm; rachis 2-5 mm long. Stipules villous toward the base, the surface of the apices usually glabrous with villous margin; petiole and rachis villous on the back, canaliculate ventral surface, glabrous; leaflets with the upper surface completely glabrous, shining, smooth, the lower surface densely villous, with hairs ca. 2 mm long, somewhat adpressed, and with the margin prominent on the lower surface, longly ciliate. Inflorescences along the length of the branches, short axillary spikes, ca. 5 mm long, 4-flowered. Flowers sessile in the axil of a bract and a bifid bractlet. Hypanthium 4-6 cm long, villous. Calyx bilabiate, villous; lower lobe subfalcate, ca. 6 mm long; upper lobe ca. 5 mm long. Standard suborbicular, 8-12 mm in diameter, orange, with red lines on the dorsal surface converging toward the base. Fruit subterranean, biarticulate; peg 2.5-5 cm long, reddish on the aerial portion and densely pubescent below ground, without adventitious roots; articles 6-9 mm long x 5-6 mm wide, the apical article somewhat larger, with beak, pericarp smooth, densely pubescent; isthmus short, 1-3 mm long. Seed 5 mm long x 3.5 mm wide. 2n=20 chromosomes (Conagin 1963, V.779, GKP 10176).

Holotype: BRAZIL. Mato Grosso. 10 km east of Cuiabá. "In shale. Species with tuberous elongated swellings on roots," 15-III-1948, J.L. Stephens SH 255 (LIL 397456!). Isotype: NA!.

Selected additional material: BRAZIL. **Goiás.** 23 km E de Caiaponia on road to Montevideu, 4-II-1959, Irwin 2570 (NY, US); 30 km N de Jataí, on road to Caiaponia, 24-X-1964, Irwin & al. 7281 (K p.p.); entre Piranhas e Bom Jardim, 6-IV-1958, A. Lima 3018 (IPA, K); rio Piracanjuba, entre Morrinhos y Caldas Novas, 6-IV-1961, Gregory & al. 10160 (CEN, CTES, GH, LIL, MO, NY, US); rio Piracanjuba, entre Caldas Novas y Piracanjuba, 7-IV-1961, Gregory & al. 10174 (CEN, CTES, LIL, NY, US); id., Gregory & al. 10176 (CEN, CTES, LIL, MO, NY, US); 15 km S de Ceres, 16-IV-1961, Gregory & al. 10258 (LIL); id., Gregory & al. 10259 (CEN, CTES, GH, LIL, MO, NY, US); 200 km S of Caiaponia, on road to Jataí, Serra de Caiapó, 17°12'S, 51°47'W, 31-X-1964, Irwin & al. 7605 (NY, US). Mun. Jaraguá: km 111, BR-153, as margins do rio Saraiva, 15°32'S, 49°27'W, Coradin 3466 (CEN); id., 2-III-1982, Valls & al. 6466 (CEN, CTES, US). Mun. Morrinhos: 100 m leste do rio Piracanjuba, entre Morrinhos e Caldas Novas, 17°43'S, 48°50'W, 23-II-1981, Valls & al. 5925 (CEN, CTES); 3 km de Israelandia, rio Claro, 15-VIII-1984, Valls & al. 7732 (CEN, CTES); 11 km N de Bom Jardim de Goiás, 16-VIII-1984, Valls & al. 7741 (CEN, CTES); id., Valls & al. 7742 (CEN, CTES). Mun. Aragarças: 5 km E do rio Araguaia, estrada para Goiás Velho, 18-VIII-1984, Valls & al. 7743 (CEN, CTES). **Mato Grosso.** Cuiabá, I-1927, Riedel 778 (K); Cuiabá, Riedel 489 (K); Cuiabá, nov.-dec. 1844, Weddell 2922 (K, P); cerrados al N de Cuiabá, Krug 17 (SP); Varzea Grande, Cuiabá, 14-III-1948, Addor (RB). Mun. Varzea Grande: BR-364, 30 km N of Cuiabá, 5-II-1978, Pedersen 12177 (C, CTES, Herb. Pedersen); Guía, próximo a Cuiabá, 24-III-1982, Prado & al. 306 (UEC); MT-060, 17 km S de BR-070 camino a Poconé, 20-I-1989, Krapovickas & al. 43052 (CTES); Corrego Ribeirão, Cuiabá, 14-III-1948, Addor (RB); 100 km SE de Cuiabá, 9-III-1959, Gregory & al. 9898 (CTES, LIL, SI, SP); id., 9900 (LIL, SI, SP); 70 km SE de Cuiabá, camino a Rondonópolis, 9-III-1959, Gregory & al. 9903 (LIL); 5 km E de Coxipó da Ponte (13 km E de Cuiabá), 9-III-1959, Gregory & al. 9905 (LIL, SI, SP); 10 km N de Cuiabá, 11-III-1959, Gregory & al. 9906 (LIL, SI); 37 km N de Cuiabá, ayo. Mirim, 11-III-1959, Gregory & al. 9907 (CTES, LIL, SI, SP); 50 km N de Cuiabá, 11-III-1959, Gregory & al. 9909 (LIL, SI); 17 km NE de Rosario Oeste, 12-III-1959, Gregory & al. 9920 (LIL, SI); 2 km NW de Cuiabá, 13-III-1959, Gregory & al. 9927 (LIL, SI). Mun. Cuiabá: BR-364 near Corrego Pindaival, 350 m, 11-II-1975, Anderson 11339 (MBM); St. Antonio de Leverger, 15-25 km S de Cuiabá, 300 m, 12-II-1975, Anderson 11352 (MBM); 35 km E de Cuiabá, BR-364, 13-XI-1975, Hatschbach 37492 (CTES, MBM); 15 km W de Cuiabá, camino a Poconé, 18-III-1976, Krapovickas & al. 30028 (CEN, CTES, GH, MO, NY, US); Fazenda Sangradouro, 22 km W de Sete Porcos, 57°15'W, 16°S, 16-XII-1976, Krapovickas & al. 30032 (CEN, CTES, G, GH, MO, NY, US); 106 km E de Cáceres, camino a Cuiabá, 57°8'W, 15°56'S, 17-XII-1976, Krapovickas & al. 30038 (CEN, CTES, GH, MO, NY, US); Barra das Garças, 13-I-1968, Philcox & al. 4013 (K, NY, UB); Xavantina, 52°14'W, 14°38'S, 30-

XII-1967, Philcox & al. 3762 (K, NY, UB); 17 km N of Aragarças, road to Xavantina, 23-XII-1967, Philcox & al. 3718 (K, NY, UB); 13 km WSW of the Cuiabá river on road from Cuiabá to Cáceres, 22-VIII-1981, Valls & al. 6332 (CEN, CTES); 126 km WSW of Cuiabá, on road to Cáceres, 22 km W of Sete Porcos, 22-VIII-1981, Valls & al. 6338 (CEN); Cáceres airport, 31-VIII-1981, Valls & al. 6411 (CEN, CTES); 21 km N of Cáceres, on road to Barra dos Bugres, 31-VIII-1981, Valls & al. 6412 (CEN, CTES); 71 km N de Cáceres, on road to Barra dos Bugres, 31-VIII-1981, Valls & al. 6414 (CEN); id., Valls & al. 6415 (CEN, CTES); 45 km S de Rosario Oeste (15 km N of Guia), 2-IX-1981, Valls & al. 6441 (CEN, CTES, NY, US). Mun. Santo Antonio de Leverger: 8 km W de Palmeiras, 30-I-1989, Krapovickas & al. 43138 (CTES). Mun. Poconé: BR-070, km 631, 17-V-1985, Valls & al. 8740 (CEN, CTES). Mun. Barra dos Bugres: Jauquara, 1-VI-1985, Valls & al. 8976 (CEN, CTES); Porto Estrela, 1-VI-1985, Valls & al. 8978 (CEN, CTES); 73 km S de Barra dos Bugres, camino a Cáceres, 1-VI-1985, Valls & al. 8982 (CEN, CTES); 56 km E de Barra dos Bugres, 2-VI-1985, Valls & al. 8989 (CEN, CTES); id., Valls & al. 8995 (CEN, CTES); 32 km E de Cuiabá, BR-364, 3-VI-1985, Valls & al. 9013 (CEN, CTES); 10 km NW de Poconé, 24-I-1985, Valls & al. 9348 (CEN, CTES); id., 9349 (CEN, CTES). Mun. N. Sra. do Livramento: 4-XI-1986, Valls & al. 10473 (CEN, CTES). **Minas Gerais.** Uberaba, Regnell III-414 (K).

Geographic distribution. This species grows south of 14°30'S in the state of Mato Grosso and in the western part of the state of Goiás. It was collected in Uberaba, in the Triangulo Mineiro. The Paraguay River, in the vicinity of Cáceres (MT), constitutes the western limit of the species. The majority of the plants which we collected grew in gravelly soil or in soils consisting of a thin layer of earth that covered a substrate of angular gravel. A few populations grew in sandy soils (Gregory & al. 9898, 10176 and 10259). Almost all of the collections were made in flooded places or places subject to flooding.

21. *Arachis retusa* Krapov., W.C. Gregory & Valls *nov. sp.*

Figs. 1,21; 24,A

Herba prostrata. Caulis pilis ca. 1 mm longis villosus. Stipulae glabrae, dorso et base villosae, margine pilis 1 mm longis ciliatae. Foliola suborbicularia, apice retuso, epiphyllo laeve, glabro, hypophyllo margine et vena media prominentibus, glabro, pilis paucis 1 mm longis in nervo medio, margine ciliis 1 mm longis et setulis viridibus nonnullis. Hypanthium 45 mm longum aliquantum villosum. Calyx 5-6 mm longus, villosulus, setulis destitutus. Vexillum 12 mm longum aurantiacum subtus lineis rubescentibus ornatum. Fructus biarticulatus, paxillo radices adventitias emitente, articulis 8-10 mm longis x 5-6 mm latis, pericarpio laevi.

Holotype: BRAZIL. Goiás. Mun. Terezina de Goiás, margem direita da estrada de Terezina para Campos Belos, logo após a ponte sobre o rio São João, flores alaranjadas com estrias no verso do estandarte, 720 m, 13°45'S, 47°14'W, Valls, Pittman & Silva 12883 (CEN). Isotype: CTES.

Prostrate herb. The main root and its branches with cylindrical tuberiform enlargements. Stem square, villous, with hairs ca. 1 mm long. Stipules with the fused part 3-4 mm long, free part 7-9 mm long x 2-2.5 mm wide, the back of fused part villous, the surfaces somewhat villous toward the base, the rest glabrous or subglabrous, with a few long hairs especially on the veins almost up to the tip, margins ciliate, with hairs 1 mm long. Leaves tetrafoliolate; petiole 5-8 mm long; rachis 5-6 mm long, both canaliculate, with hairs on the back, the canals glabrous, that of the petiole separated from the canal of the rachis by a transverse line of hairs. Apical leaflets 12-22 mm long x 12-20 mm wide, basal leaflets ca. 11-19 mm long x 11-16 mm wide, suborbicular, the apex retuse with an indentation of 1-1.5 mm, upper surface smooth, lower surface with the margin and the midvein prominent, secondary veins somewhat marked, both surfaces glabrous, with only scattered hairs 1 mm long on the midvein; the margin with cilia 1 mm long and some short bristles. Hypanthium 45-55 mm long, somewhat villous. Calyx bilabiate, upper lobe 5 mm long, lower lobe falcate, 6 mm long, somewhat villous, without bristles. Standard 12 mm long x 14 mm wide, orange, with reddish lines on the outside surface. Fruit subterranean, the pegs often have adventitious

roots, articles 8-10 mm long x 5-6 mm wide, pericarp smooth. Seeds 6 mm long x 4 mm wide.

Additional material: BRAZIL. **Goiás.** 4 km da Estrada de Teresina de Goiás a Monte Alegre de Goiás. Erva rastejante. Flores amarelas formando relvado em local pertubado do mata ciliar do rio São João, 1-XII-1991, Pereira & al. 1948 (CTES, IBGE); 2 km ao norte de Teresina e 34 km ao sul do rio Paranã, ao longo da estrada para Monte Alegre, 590 m, 13°34'S, 47°13'W, 14-IV-1986, Valls & al. 9950 (CEN, CTES). Mun. Teresina de Goiás: 13°45'S, 47°14'W, Valls & al. 12883 (CEN). **Tocantins.** Mun. Paranã: Paranã, 270 m, 12°37'S, 47°53'W, Valls & al. 12939 (CEN, CTES); 46 km SE de Gurupi, a 12 km NW do rio Teresa, Faz. Taboca, na estrada Gurupi-Peixe, 290 m, 11°55'S, 48°44'W, 5-III-1982, Valls & al. 6517 (CEN, CTES).

Geographic distribution. This species grows in the extreme northeast of the state of Goiás and in the south of the state of Tocantins (Brazil).

22. *Arachis Burchellii* Krapov. & W.C. Gregory *nov. sp.*

Fig. 1,22

Herba perennis. Radicis ramificationes tuberculares. Caulis villosus, principalis erectus, rami procumbentes. Stipulae subglabrae dorso pilis longis, margine ciliis longis instructae. Folia caulis principalis foliolis oblongis, illa ramorum foliolis ovatis vel interdum oblongis aut raro obovatis, omnibus epiphyllo laevi, nitido, pilis usque ad 1 mm longis vestito, hypophyllo pilis adpressis vix perspicuis saepe pilis longis sparsim immixtis, nervo medio villoso et margine ciliis longis setulisque brevibus instructo prominentibus. Hypanthium 3.3-4.8 cm longum, laxe villosum. Calyx 4-6 mm longus, villosus, setulis destitutus. Vexillum 7-11.5 mm longum x 10-13 mm latum, luteo-aurantiacum dorso lineis rubescentibus ornatum. Fructus biarticulatus paxillo glabro, 6-10 cm longo radices adventitias emittente, articulis 10-11 mm longis x 6-7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Tocantins. 5 km N de Araguaina, 300 m, creeping herb, forming extensive mats, corolla yellow-orange, cut-over sandy cerradao, 14-III-1968, Irwin, Maxwell & Wasshausen 21163 (RB). Isotypes: K, LIL, NY, UB, US.

Perennial plant. Root with tuberiform enlargements 20 mm long x 6 mm thick. Primary stem erect, 3-5 cm long, with the stem covered by the stipules; lateral branches prostrate, 0.5-1 m long, internodes usually 2-3 cm but up to 4 cm long, angled, reddish, villous, with short adpressed hairs and long hairs 1.5-2 mm long, more dense toward the nodes. Leaves tetrafoliolate. On the primary branches, the fused portion of the stipules 6-8 mm long, the free portion 9-10 mm long; petiole 8-14 mm long; rachis 3-6 mm long; leaflets oblong, the basal 16-19 mm long x 6-8 mm wide, the apical 18-20 mm long x 8-9 mm wide. On the lateral branches, the fused portion of the stipules 3-5 mm long, the free portion 7-11 mm long; petiole 3-6 (8) mm; rachis 3-4 (5) mm long; leaflets usually ovate, occasionally oblong and rarely obovate, basal leaflets 8-12 mm long x 4-8 mm wide, the apical pair 10-13 mm long x 5-10 mm wide. Fused part of the stipules with long hairs on the back, the surfaces subglabrous, with few adpressed hairs, to villous; the free portion triangular, acute, with prominent veins toward the base and with a single vein toward the apex, external surface glabrous or with some short adpressed hairs, and occasionally also with a few long hairs, margin longly ciliate. Petiole and rachis villous except glabrous on upper, canaliculate surface. Pulvinus villous. Leaflets with the upper surface smooth, shining, with long hairs, up to 1 mm long, scattered, at times only present on some leaves; lower side with midvein and margin prominent, surface with barely visible adpressed hairs and with scattered long hairs or without them, midvein villous, margin with long cilia and emergences with a thick base and a short bristle. Flowers all along the prostrate branches, in very short axillary spikes, 3-4 flowered. Hypanthium 33-48 mm long, softly villous. Calyx villous, without bristles; upper lobe 4-5 mm long, lower lobe subfalcate, 5-6 mm long. Standard 7-11.5 mm long x 10-13 mm wide, yellow-orange, with reddish or purple lines on the dorsal surface, converging toward the base. Pegs purple,

glabrous on the aerial portion, pubescent and with adventitious roots below ground, 6-10 cm long. Fruit articles 10-11 mm long x 6-7 mm wide, pericarp smooth. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Selected additional material: BRAZIL. **Goiás.** 25 km SW of Monte Alegre de Goiás, northern spur of Serra Atalaia, 600 m, 13-III-1973, Anderson 7021 (K, NY, UB, US). Mun. Cavalcante: entre Campos Velhos y Alto Paraíso do Norte, km 98, 14°33'S, 47°16'W, 510 m, Coradin 3836 (CEN). **Maranhão.** Taquara, 5 km NW of Balsas, 7°29'S, 46°3'W, 250 m, 15-III-1962, Eiten & al. 3620 (NY, SP); Imperatriz, aeroporto, 27-IV-1982, Pires 17643 (CTES). Mun. Imperatriz: "Bananal," 15 km S of Imperatriz, BR-010, 5°40'S, 47°26'W, 290 m, 29-II-1980, Plowman & al. 9370 (CTES); 33 km N de Imperatriz, BR-010, 2-III-1982, Valls & al. 6586 (CEN, CTES); 13 km S de Imperatriz, BR-010, 12-III-1982, Valls & al. 6600 (CEN, CTES); 40 km S de Imperatriz, BR-010, km 1303, 12-III-1982, Valls & al. 6602 (CEN, CTES); 41 km S de Imperatriz, 12-III-1982, Valls & al. 6604 (CEN, CTES); 48 km S de Imperatriz, 12-III-1982, Valls & al. 6605 (CEN, CTES). Mun. Montes Altos: km 1302, BR-019, 5°46'S, 47°21'W, Coradin 3659a (CEN); BR-010, km 1303, 5°46'S, 47°21'W, 230 m, 7-X-1980, Coradin 3660 (CEN); BR 010, km 1330, 5°34'S, 47°26'W, 250 m. Coradin 3669 (CEN); 12 km N de Carolina, 17-III-1985, Valls & al. 8352 (CEN, CTES); 17 km N de Carolina, 17-III-1985, Valls & al. 8359 (CEN, CTES); 9,5 km N de Carolina 17-III-1985, Valls & al. 8375 (CEN, CTES); 20 km SW of Riachão, BR-230, 18-III-1985, Valls & al. 8390 (CEN, CTES); Balsas, 19-III-1985, Valls & al. 8402 (CEN, CTES); 6 km NE de Balsas, 19-III-1985, Valls & al. 8405 (CEN, CTES); 6 km SE of Vale Verde entre Balsas e São Raimundo, BR-230, 19-III-1985, Valls & al. 8413 (CEN, CTES); km 567,5 da BR-316 entre Timon e Caxias, 24-III-1985, Valls & al. 8496 (CEN, CTES). **Mato Grosso.** Mun. São Felix do Araguaria: BR-242, 24 km E de BR-158, 20-VIII-1984, Valls & al. 7799 (CEN, CTES); 16,4 km W de São Felix do Araguaria, BR-158, 22-VIII-1984, Valls & al. 7805 (CEN, CTES). Mun. Luciara: 14 km S de Porto Alegre, BR-158, 23-VIII-1984, Valls & al. 7821 (CEN, CTES). Mun. Santa Terezinha: 15,2 km do aeroporto de Santa Terezinha na estrada para BR-158, 24-VIII-1984, Valls & al. 7850 (CEN, CTES); Santa Terezinha, 25-VIII-1984, Valls & al. 7868 (CEN, CTES). **Pará.** 36,3 km W de Campo Alegre, 9°25'S, 50°39'W, 26-VIII-1984, Valls & al. 7875 (CEN, CTES). **Piauí.** Km 76 estrada Teresina-Campo Maior, 8-III-1968, Andrade-Lima 68-5328 (CEN, CTES). Mun. Altos: Altos, km 311, BR-343, 23-III-1985, Valls & al. 8473 (CEN, CTES); km 42 on BR-316 ao sul de Teresina, 1 km S de Demerval Lobao, 26-III-1985, Valls & al. 8501 (CEN, CTES). **Tocantins.** 2 km S of Guará, 550 m, sandy cerrado, 19-III-1968, Irwin & al. 21448 (NY,UB); 24 km S of Paraíso, 600 m, 24-III-1968, Irwin & al. 21732 (HB, NY, RB, UB, US); 28,6 km S of Paraíso do Norte de Goiás on Belém-Brasilia highway, 10°24'S, 49°W, 280 m, 27-XII-1969, Eiten & al. 10051 (K, NY, US); Estreito para Tocantinópolis, 24-IV-1971, Duarte 13942 (NY); Porto Real (Porto Nacional), 17-XI-1828, Burchell 8443 (K); Natividade to Porto Real, btw. Carmo & Corrego Fundo, 12-XI-1828, Burchell 8328 (K); id., Burchell 8358 (K, P). Mun. Presidente Kennedy: Road from BR-153 to Itapora 12 km W of Pres. Kennedy, Fazenda Primavera along Riberao Feinho, 8°25'S, 48°37'W, 400-500 m, 31-I-1980, Plowman & al. 8174 (CTES). Mun Tocantinópolis: BR-153, km 1192, 6°38'S, 47°34'W, 300 m, 7-X-1980, Coradin 3650 (CEN). Mun. Araguaina: BR-010, km 1097, 7°14'S, 48°15'W, 250 m, Coradin 3715 (CEN), 11 km de Paraíso do Norte, Coradin 3724 (CEN). Mun. Natividade: entre Natividade y Dianópolis km 5, 11°40'S, 47°47'W, 370 m, Coradin 3755 (CEN); Natividade, 3 km N do entroncamento para Porto Nacional na estrada para Dianópolis, 16-III-1982, Valls & al. 6640 (CEN, CTES); Estreito-Marabá km 1, 5-IV-1974, Pinheiro & al. 90 (NY). Mun. Formoso do Araguaia: 2 km de Formoso na saida para o rio Javaé, 4-III-1982, Valls & al. 6496 (CEN, CTES). Mun. Cristalandia: 42 km N de Gurupí, BR-153, 6-III-1982, Valls & al. 6530 (CEN, CTES); id., 15-III-1985, Valls & al. 8309 (CEN, CTES); Rosalandia, BR-153, 6-III-1982, Valls & al. 6532 (CEN, CTES); id., 15-III-1985, Valls & al. 8321 (CEN, CTES). Mun. Miracema do Norte,: 1 km N do rio dos Bois, km 854, BR-152, 7-III-1982, Valls & al. 6540 (CEN, CTES); BR-153, 29 km N de Miranorte, 7-III-1982, Valls & al. 6546 (CEN, CTES). Mun. Tupiratins: 150 m N do rio Feio, BR-153, 8-III-1982, Valls & al. 6554 (CEN, CTES). Mun Colinas de Goiás: 18 km N de Colinas, BR-153, 8-III-1982, Valls & al. 6555 (CEN, CTES); 3 km S de Araguaina, BR-153, 9-III-1982, Valls & al. 6556 (CEN, CTES); Araguaina, BR-226, 10-III-1982. Valls & al. 6558 (CEN, CTES). Mun. Babaçulandia, 18 km SW of Wanderlandia, BR-153, 6°56'S, 48°05'W, 420 m, 26-II-1980, Plowman & al. 9164 (CTES), Vanderlandia, 10-III-1982, Valls & al. 6559 (CEN,

CTES); 12 km S de Vanderlandia, 10-III-1982, Valls & al. 6566 (CEN, CTES); 7 km NE de Vanderlandia, 16-III-1985, Valls & al. 8335 (CEN, CTES). Mun Tocantinópolis: 56 km NE de Vanderlandia, BR-226, 10-III-1982, Valls & al. 6574 (CEN, CTES); id., 16-III-1985, Valls & al. 8343 (CEN, CTES). Mun. Paraiso do Norte,: 12 km de Paraiso do Norte na estrada a Porto Nacional, 15-III-1982, Valls & al. 6633 (CEN, CTES); id., 6634 (CEN, CTES); id., 6635 (CEN, CTES); 24 km SW de Paraiso do Norte na estrada para Porto Nacional, 15-III-1982, Valls & al. 6636 (CEN, CTES). Mun. Porto Nacional: 32 km W da ponte sobre rio Tocantins, na estrada de Paraiso do Norte a Porto Nactional, 15-III-1982, Valls & al. 6637 (CEN, CTES). Mun. Pium: proximo a margem da Ilha do Bananal, em frente a Santa Terezinha, 25-VIII-1984, Valls & al. 7863 (CEN, CTES). Mun. Miracema do Norte: BR-153, km 383 a 13,6 km S do rio dos Bois, 27-VIII-1984, Valls & al. 7880 (CEN, CTES).

Geographic distribution. Occurs in Tocantins and adjacent localities in the states of Goiás, Maranhão and Piauí. It grows forming a mat, principally in the "cerrado" and in the gallery forest, in sandy soil, sometimes with clay subsoil.

Obs. This species is very closely related to *A. prostrata* and *A. lutescens*, with which it forms a group that is differentiated from the rest of the species of this section by the size of the leaflets, which are the smallest. Despite this similarity, we consider them as independent entities for having different ranges. Going from southwest to northeast through the range of the section, the geographic sequence is *A. lutescens*, *A. prostrata* and *A. Burchellii*.

We dedicate this species to W.J. Burchell, who collected it for the first time in 1828 in the vicinity of Porto Real (today, Porto Nacional) on the Tocantins River.

23. *Arachis Pietrarellii* Krapov. & W.C. Gregory *nov. sp.*
Figs. 1,23; 16,D-F

Herba perennis. Radix tenuis, ramificationibus tubercularibus. Caulis villosus, principalis erectus, rami decumbentes. Stipulae villosae usque subglabrae, ciliatae. Foliola oblonga epiphyllo viridi-olivaceo, nitido, pilis ca. 1.5 mm longis sparsim vestito, margine manifestiore, hypophyllo villoso nervo medio prominente, margine dense plus minusve adpresse-ciliato conspicuo. Fructus biarticulatus, paxillo ca. 15 cm longo, radices adventitias emittente, articulis 8 mm longis x 5 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso. 17 km NW de Rosario Oeste, 12-III-1959, Gregory, Krapovickas & Pietrarelli 9923 (CEN). Isotypes: CTES, GH, LIL, MO, NY, SP, US.

Perennial plant. Root slender, with fusiform enlargements 2-4 cm long x 0.5 cm wide. Mainstem erect, sometimes reclining, ca. 45 cm long. Four prostrate lateral branches ca. 1.20 m long. Internodes angled, villous, glabrous toward the base of the branches. On the mainstem, the first internode ca. 10 cm long, those following shorter, usually 3-5 cm long and toward the apex they are reduced to ca. 2 cm long. On the lateral branches, the internodes 2-4 cm long. Leaves with 4 oblong leaflets. On the mainstem, stipules with the fused portion 12-15 mm long x 3 mm wide, the free portion 16-22 mm long x 2 mm wide, acute, with rigid apex, marked longitudinal veins, margin ciliate, surfaces glabrous except for a few hairs toward the base; petiole 24-29 mm long, villous; rachis 9-13 mm long, villous; apical pair of leaflets up to 35 mm long x 12 mm wide, basal pair up to 30 mm long x 11 mm wide. On the lateral branches, the fused portion of the stipules 4-9 mm long x 1.5-2 mm wide, the free portions 8-13 mm long x 1.5-2 mm wide, villous; petiole 5-14 mm long, villous; rachis 4-8 mm long; apical pair of leaflets 13-23 mm long x 7-10 mm wide, the basal pair 12-20 mm long x 5-8 mm wide; upper surface olive green, shiny, with long (ca. 1.5 mm) scattered hairs, margin somewhat prominent; the lower surface with long hairs similar to those on the upper surface but more dense, the midvein prominent, villous, the surface between the secondary veins with reddish spots, margin pronounced, with abundant cilia, more or less adpressed. Inflorescences in axillary spikes distributed along the length of

the branches, 2-3-flowered, axes short; bracts filiform and lanceolate, 5 mm long. Pegs horizontal, shallow, growing parallel to the surface of the soil, ca. 15 cm long, subglabrous, reddish. Articles smooth, 8 mm long x 5 mm wide. 2n=20 chromosomes (Smartt 1964, GKP 9923).

Additional material: BRAZIL. **Mato Grosso.** Mun. Nobres: 900 m ao N do Corrego Seco e a 4 km ao S de Nobres, ao N de Rosario Oeste, 25-I-1989, Valls & al. 12085 (CEN, CTES); 1,4 km S do acesso a Nobres na estrada de Rosario Oeste a Sinop, 25-I-1989, Valls & al. 12086 (CEN, CTES); 15 km N de Rosario Oeste, 2-VI-1985, Valls & al. 9000 (CEN, CTES); 17 km N de Rosario Oeste, 2-VI-1985, Valls & al. 9004 (CEN).

Related material: BRAZIL. **Mato Grosso.** Mun. Agua Boa: BR-158, 27,2 km ao norte de Agua Boa, 19-VIII-1984, Valls & al. 7784 (CEN, CTES); 40,8 km N de Agua Boa, 19-VIII-1984, Valls & al. 7786 (CEN, CTES). Mun. Canarana: 37 km S de Cascalheira, 19-VIII-1984, Valls & al. 7793 (CEN, CTES). Mun. Santa Teresinha: Santa Teresinha, 25-VIII-1984, Valls & al. 7861 (CEN, CTES).

Geographic distribution. The type collection was made in the south central part of Mato Grosso in the vicinity of Nobres, situated some 18 km north of Rosario Oeste, at the foot of the Serra do Tombador. It also grows in eastern Mato Grosso, on the eastern slope of the Serra do Roncador, between Agua Boa and Santa Teresinha, along the Araguaia River, where it was collected in August, in the dry season, for which its identification remains tentative.

Obs. *Arachis Pietrarellii* is related to *A. Macedoi,* from which it differs by its larger, somewhat more obtuse leaflets, especially in the leaves of the lateral branches, and by the more marked margin. It is also similar to *A. villosulicarpa,* but its fruits are much smaller. The pegs of *A. Pietrarellii* customarily form roots which enlarge into tuberoids, and plantlets can arise at the junction of root and peg.

We dedicate this species to José R. Pietrarelli, fellow explorer, who found this species.

24. *Arachis villosulicarpa* Hoehne

Fig. 1,24

Hoehne, Arq. Bot. Estado São Paulo, n.s. 2: 16-18, táb. 5, 1944. Gregory, Res. and Farming 5, Prog. Rep. 4: figs. 25-26 and 28, 1946, "diploid." Mendes, Bragantia 7: 262, 1947, 2n=20. Conagin, Bragantia 21: 345-348, est. 1 & 2, figs. 2A, 2B and 9, 1962.

Perennial plant; taprooted in the first months, later with branch roots very much thickened, customarily producing vegetative sprouts. Mainstem erect, some 60 cm tall, normally producing only vegetative branches; lateral branches prostrate, 1 m long (in the type), or decumbent up to 35 cm long; internodes angled, 22-40 mm long, villous. Fused portion of the stipules 10-17 mm long x 6 mm wide, the free tips acute, 10-20 mm long. Petiole canaliculate, 19-50 mm long; rachis 5-13 mm long. Leaflets 4, elliptical, the apical pair 20-44 mm long (up to 50 mm in the type) x 6-16 mm wide (up to 22 mm in the type), the basal pair 16-40 mm long x 5-15 mm wide. Stipules villous toward the base, with subglabrous surfaces, prominent veins and ciliate margin. Petiole and rachis villous, except on both canals. Pulvinus villous. Upper surface of the leaflets with sparse, very adpressed hairs when young, later glabrous, smooth, bright green; lower surface subvillous to glabrescent, with long hairs on the midvein; margin barely marked, ciliate. Inflorescences with very short axes, covered by the stipules, distributed principally along the tertiary branches. Hypanthium usually 4 cm long, varying between 2.1 and 7 cm, villous. Calyx bipartite, 5-6 mm long, pilose. Standard 6-10 mm long x 10-15 mm wide, orange, with red lines on the back converging toward the base. Fruit subterranean, biarticulate; pegs inclined 40°-70°, 6-16 cm long, commonly 13 cm long, striate, glabrous, frequently bearing roots; isthmus 13 mm long; articles usually 18 mm long x 8 mm wide, varying from 16 x 8 to 23 x 10 mm, S-shaped, densely villous; pericarp smooth; seeds 10-18 mm long, S-shaped, elongated. 2n=20 chromosomes (Mendes 1947).

Holotype: BRAZIL. São Paulo. Cult. Jardim

Botanico de sementes trazidas pelo Sr. Antonio Telles como procendentes dos Indios Nambiquaras, Juruena, M. Grosso, Gehrt s.n., 8-I-1943 (SP 47535!). Isotype: K!. The chromosome count 2n=20 (Mendes 1947: 262) was determined with seeds of these cultivars (SP 47535).

Selected additional material: BRAZIL. **Mato Grosso.** Mun. Vila Bela: Posto Indigena Mamainde, 82 km SE de Vilhena, e logo ca. 20 km SW da BR-174, 21-V-1985, Valls & al. 8820 (CEN, CTES). **Rondonia.** Vilhena, 21-V-1985, Valls & al. 8816 (CEN, CTES); id., 8818 (CEN, CTES). **São Paulo.** Campinas, Instituto Agronômico, V-44 (Procedencia: Mato Grosso, Vilhena, leg. Pedro de Barros, 2-IX-1938, I-2288), II-1960, Conagin 18 (IAC 18675); Cult. V 44, 4-VI-1968, Krapovickas & al. 14446 (CTES); Cult. V 862, 5-VI-1968, Krapovickas & al. 14445 (CTES).

Common name. "amendoim bravo" (IAC, V.44). "wi-ki-rin-gui," the name provided in Vilhena by the native informant Frederico of the Tauandé tribe (Valls 8818).

Geographic distribution. This is a cultivated species about which there is no information known regarding its existence in the wild state. The material was provided by the indigenous people that live in the vicinity of Juruena, in the west central part of Mato Grosso, and from Vilhena, in the eastern extreme of Rondonia (Krapovickas & al. 1985: 41).

Obs. 1. *Arachis villosulicarpa* was only known from seven fruit samples from Vilhena and Juruena, sent through intermediaries to the Instituto de Botánica de São Paulo and the Instituto Agronômico de Campinas (SP), between 1938 and 1945. The original information described it as a native crop, but the name "amendoim bravo" of the only surviving sample would indicate a wild condition for the material. It was not clear if the fruits used for food came from cultivation or if the natives were collecting them in the wild.

Recently, we (Valls, Krapovickas and Simpson) obtained, near Vilhena, fruits harvested by members of two indigenous tribes and had the opportunity to visit a third tribe, where we saw the plants in cultivation. In these three cases the natives had no knowledge of this species in the wild state, each tribe maintaining its own seed. One proof of its condition as a cultivated plant is the strength of the peg, which is much stronger than can be found in the wild species.

Evidently, we are witnessing a domestication process independent of that of *A. hypogaea*. Both species belong to different sections, between which it has not yet been possible to obtain any hybrid. In the section *Extranervosae*, the species most similar to *A. villosulicarpa* is *A. Pietrarellii*, for its vegetative character, but having much smaller fruits (fig. 1, 23 and 24).

Obs. 2. In the archives of the Instituto Agronômico at Campinas, the following collections are recorded, all from Mato Grosso.

V.44 (I.2288), Amendoim bravo, Estaçao Telegráfica de Vilhena, norte de Mato Grosso. Enviado por Pedro Paes de Barros, agrónomo do D.N.P.V., Cuiabá, 20.9.1938.

V.80 (I.5893), Mato Grosso. Obs. amostra de sementes ... esse material se asemelha com o de no. I.2288. Processo no. 43.372.

V.122 (I.7241), Amendoim I, Cultivado pelos indios Nambyquaras en Juruena, Mato Grosso. Material trazido pelo Sr. Athos de Souza Lima. Entregue ao Sr. Octacilio Ferreyra de Souza. 11.I.1945.

V.123 (I.7242), Amendoim III, id.

V.125 (I.7244), Amendoim II, id.

V.131 (I.7746), Mato Grosso. Pequena amostra de sementes recebida pelo Sr. Octacilio F. de Souza, por intermédio do Monsenhor João Baptista du Dreneuf S.J. Administrador Apostólico da Prelazia de Diamantino, no estado de Mato Grosso. Esse amendoim foi obtido com os indios de Juruena, tratando-se, talves, da mesma especie que ha tempos, recebi do Snr. Raul Drummonde Golsalves, dessa mesma localidade e encaminhei ao Instituto Agronômico. O material depois de passar pelos tratamentos necessarios foi devolvido a Secçao de Oleaginosas, para o Snr. Octacilio F. de Souza. 19.IX.1945.

V.284 (I.14538), North Carolina. Sementes trazidas pela Dra. C.H.T. Mendes Conagin. Sementes da var. 118. Cit. 862. Agosto de 1952.

862 = V.284

According to Conagin (1962: 348) the plants of V.125 have completely prostrate lower branches, for which they are more like the original description. The rest of the materials studied by Conagin have decumbent branches.

Hoehne describes this species with very long, prostrate, root-bearing stems. It is possible that this observation is due to the presence of pegs with adventitious roots, frequent in this species.

Obs. 3. *Arachis villosulicarpa* is, genetically, a very isolated species. We only obtained hybrids, that were highly sterile, in crosses with *A. lutescens, A. Macedoi, A. marginata* and *A. prostrata*, all in the same section.

Obs. 4. In 1974, Pire studied the pollen of *A. villosulicarpa*, finding tri-colpate grains that are syncolpate, that is, with the colpae united at the poles, similar to those of the genus *Stylosanthes.*

IV. *Sect. Triseminatae* Krapov. & W.C. Gregory *nov. sect.*

Fig. 5

Sect. Triseminatae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 93, 1973, *nomen nudum.*

Perennes. Radix palaris ramificationibus tenuibus non incrassatis. Stipulae marginibus connatis tubum brevem 1-2 mm longum efficientes apice subulatae. Folia quadrifoliolata. Vexillum aurantiacum supra subtusque lineis rubescentibus ornatum. Fructus subterraneus 2-3 articulatus paxillo horizontale paulo profundo, pericarpio laevi.

Typus sectionis: *Arachis triseminata* Krapov. & W.C. Gregory

Perennial plant. Taproot, without thickenings. Mainstem erect and branches decumbent. Stipules somewhat fused at the base forming a very short tube and with the apices subulate. Leaf tetrafoliolate. Flowers small, along the length of the branches. Hypanthium ca. 45 mm long. Standard orange with a conspicuous purple spot toward the base on the upper surface and with fainter red lines on the lower surface. Fruit subterranean, frequently with three segments; peg and isthmi elongated, horizontal, shallow; articles single-seeded; pericarp smooth, covered with a dense layer of hairs. 2n=20 chromosomes (Gregory & al. 1973).

25. *Arachis triseminata* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,25; 23,C

A. pusilla auct. non Bentham, Gregory & al., in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 121, 1973.

Herba perennis. Caulis villosus, principalis erectus, rami decumbentes. Stipulae marginibus basi connatis tubum brevem 1-2 mm longum efficientes, apice subulatae pilis longis sparsim vestitae, margine ciliatae. Foliola ovalia usque obovata, acuta, epiphyllo laevi, glabro, hypophyllo villoso, nervo medio prominente, margine ciliato. Hypanthium 4.5 cm longum, villosum. Calyx 4-5.5 mm longus, villosus. Vexillum 8-9 mm longum x 10 mm latum, aurantiacum. Fructus 2-3-articulatus, paxillo horizontali usque ad 72 cm longo, isthmo 20-37 cm longo, articulis 10-12 mm longis x 6-7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Bahia. Juazeiro, Estaçao Experimental Mandacarú, 6-IV-1967, Gregory & Krapovickas 12881 (CEN). Isotypes: C, CTES, G, GH, MBM, MO, NY, US.

Perennial plant. Taproot deep, with slender branches. Mainstem erect and lateral branches decumbent; stem angular with copper-colored hairs ca. 1.5 mm long, dense, especially on the young parts. Leaves tetrafoliolate, those of the mainstem somewhat larger than those of the lateral branches. On the mainstem, the fused portion of the stipules up to 10-12 mm long, the free portion up to 23 mm long; petiole up to 60 mm long; rachis up to 19 mm long; apical pair of leaflets up to 29 mm long x 17 mm wide, the basal pair up to 28 mm long x 16 mm wide. On

the lateral branches, the fused portion of the stipules 7 mm long, the free portion 10-17 mm long; petiole usually 25 mm but up to 40 mm long; rachis 8-15 mm long; apical pair of leaflets usually 17 mm long x 9 mm wide but up to 26 x 17 mm; the basal pair 15 x 17 mm but up to 26 x 14 mm. Stipules with the fused part papery with margins united toward the base forming a short tube 1-2 mm long, external surface with long scattered hairs; free portion subulate, with a single vein and ciliate margins. Petiole with long hairs, ca. 2 mm, and small adpressed hairs, canal on upper side narrow and with small hairs, separated from the rachis canal by a transverse line of long hairs, also present at the juncture of the second pair of leaflets. Leaflets oval, sometimes obovate, acute toward the tip and with the apex apiculate; upper surface smooth, glabrous; lower surface villous, midvein prominent, secondary and marginal veins little marked, margin ciliate. Flowers abundant along the length of the branches, in short, 3-flowered spikes. Hypanthium 45 mm long (29-74 mm), hyaline, villous. Calyx 4-5.5 mm long, villous. Standard 8-9 mm long x 10 mm wide, orange, yellow in the center, with red lines on both sides, more intense on the upper surface, wings yellow, 6-7 mm long. Fruit subterranean, 2-3-articled; peg more or less horizontal, commonly 30 cm long but up to 72 cm long, isthmus 20-37 cm long; fully developed articles 10-12 mm long x 6-7 mm wide, covered with a dense coat of very short hairs, when the hairs fall the surface is completely smooth; the peg is inserted on the extreme basal end of the articles at that thick point, ca. 2 mm wide; the isthmus is borne at the apical end without forming a beak, giving the article a small dorsal hump. Cotyledons oval-shaped, the upper surface with veins very sunken. 2n=20 chromosomes (Gregory & al. 1973).

Additional material: BRAZIL. **Bahia.** Juazeiro, III-1912, Löfgren 906 (RB); Juazeiro, Horto Florestal, III-1912, Zehntner 36-906 (R); id., 4-I-1964, Andrade-Lima 64-4200 (CEN); Estaçao Experimental do Mandacarú, 13 km NE of Juazeiro, 22-VI-1981, Valls & al. 6240 (CEN, CTES); Juazeiro, 2 km a leste da BR-407 na estrada para Curaçá, 10-IV-1983, Valls & al. 7232 (CEN, CTES); 29 km S de Juazeiro, BR-407, 11-IV-1983, Valls & al. 7243 (CEN, CTES); 51 km S de Juazeiro, BR-407, 11-IV-1983, Valls & al. 7246 (CEN, CTES); 5 km of Juazeiro, SUDENE, Research Station, 370 m, 5-II-1972, Pickersgill RU72-81 (CTES, IPA, US); 15 km W de Juazeiro, 8-IV-1967, Gregory & al. 12922 (BAA, CTES, GH, MO, NY, US); 15 km de Juazeiro na direçao de Uauá, 18-VIII-1965, Andrade-Lima 65-4317a (IPA); Fazenda Tourão, 6 km Leste de Juazeiro na estrada para Curaçá, 18-VI-1981, Valls & al. 6188 (CEN, CTES). Mun. Xique-Xique: baixios de Irece, 10-VI-1986, Pinto 61/86 (CTES). Mun. Barra: 15 km E de Javi, BR-242, entre Barreiras e Ibotirama, 12°12'S, 43°36'W, 6-V-1982, Valls & al. 6772 (CEN, CTES); 43,3 km W do rio São Francisco (Ibotirama), BR-242, 12°21'S, 43°38'W, 14-IV-1983, Valls & al. 7292 (CEN, CTES). **Minas Gerais.** Mun. Janaúba: 15°27'S, 43°27'W, Valls & al. 13080 (CEN). **Pernambuco.** Mun. Petrolina: ao lado de canais de irrigaçao do rio São Francisco, 26-II-1978, Leitao Filho & al. 8912 (MG, UEC).

Common name. "mundubi" (Valls & al. 7243).

Geographic distribution. This species grows in the state of Bahia, in the south of Pernambuco and in the north of Minas Gerais, and in the vicinity of the São Francisco River. The most widely separated localities are found between 40 and 50 km on either side of said river. It is a component of the "caatinga" woodland vegetation, growing in compacted silty soil. Plants typically form dense stands and provide a very palatable feed for livestock.

Obs. *Arachis triseminata* is a species that is genetically very isolated because it was not possible to obtain any hybrids in the interspecific crosses attempted.

Crosses between accessions of the same species from different locations produced hybrids with 50.7 and 68.2% fertile pollen. This is a very interesting result, given that the two populations were separated by a distance of some 20 km. Both populations showed no appreciable morphological differences, which suggests the development of some type of intraspecific genetic barrier.

V. *Sect. Heteranthae* Krapov. & W.C. Gregory *nov. sect.*

Fig. 6

Sect. Ambinervosae Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973, *nomen nudum.*
Sect. Pseudoaxonomorphae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 92, 1973, *nomen nudum.*

Annuae vel biennes. Radix palaris ramificationibus tenuibus, non incrassatis. Caulis prinicipalis erectus, rami procumbentes. Stipulae marginibus liberis usque ad basem apice aciculares. Folia quadrifoliolata. Flores dimorphi: parvissimi hypanthio brevissimo, minus quam 2 cm, calice 2-3 mm longo, corolla clausa, et flores normales hypanthio extenso, calice majore corolla expansa. Fructus subterraneus, biarticulatus, paxillo horizontali.

Typus sectionis: *Arachis Dardani* Krapov. & W.C. Gregory

Annual or biennial herbs. Taproot with slender branches. Mainstem erect, branches procumbent. Stipules with the margins free to the base and with acicular apices. Leaves tetrafoliolate. Dimorphic flowers, distributed along the length of the lateral branches. Very small flowers are produced, with the hypanthium from 3 to 20 mm long and the calyx and corolla closed, 2-3 mm long; as well as normal flowers with the hypanthium extended, the calyx larger and the corolla expanded. Standard orange or yellow, with reddish lines on the outside surface or on both surfaces. Fruit subterranean, biarticulate; peg and isthmus horizontal, not deep; articles single-seeded; pericarp smooth, covered with a dense layer of hairs. 2n=20 chromosomes.

Geographic distribution. This is a typically northeastern section. It is present in all of the states that constitute the "Nordeste" region of Brazil and barely exceeds their boundaries, towards the south in Minas Gerais and towards the west in Goiás. There is a collection made on Marajó Island, in the mouth of the Amazon River, which we tentatively identify as *A. Dardani*, and which is very interesting because it is the only known case of a wild species of *Arachis* having crossed the Amazon.

Obs. Initially (Gregory & al. 1973: 120), this section was comprised by *A. Dardani*, a species whose standard had red lines on both sides. Later, with the new explorations, upon analyzing *A. pusilla* and *A. sylvestris*, it became evident that the three species formed a fairly homogeneous group, composed of annual taxa adapted to extreme environmental conditions, such as are often present in the northeast of Brazil, where the "caatinga" predominates. Recently, *A. Giacomettii* was added, which is also an annual and has dimorphic flowers.

In *A. pusilla* and in *A. Giacomettii* the standard exhibits the reddish lines on both surfaces, but in *A. sylvestris*, said lines are found on the lower side, as in the section *Extranervosae*. We believe, for reasons of geographic distribution and because these species share the presence of dimorphic flowers, a character that is not present in any other section, that it is advisable to include *A. sylvestris* in this section, making the standard's coloration no longer an exclusive character of the group.

Key for distinguishing the species

A. Stem, stipules and petiole with indumentum composed only of rigid bristles, 2-3 mm long. Canal of the petiole very narrow, separated from the canal of the rachis by a pilose transverse prominence. Leaflets with the upper surface glabrous. Standard with reddish lines on both surfaces.

26. *A. Giacomettii*

A'. Indumentum composed of hairs of different length, if there are long hairs present they are 2 mm long, soft, undulate, not rigid. The petiole-rachis canal is wide, separated or not.

B. Standard orange with reddish lines only on the dorsal surface; wings yellow. Canal of the petiole separated from the canal of the rachis by a pilose transverse prominence. If there are bristles on the lower leaf surface, they are not orderly. Pericarp smooth. Leaflets commonly with hairs on both surfaces, rarely with the upper surface glabrous.

27. *A. sylvestris*

B'. Standard with reddish lines on both surfaces. Upper leaf surface glabrous.

C. Canal of the petiole separated from the canal of the rachis by a prominence and transverse line of hairs. Frequently bristles on the upper leaf surface, orderly, forming a line parallel to the margin. Pericarp smooth. Wings yellow with the apex and internal margin orange.

28. *A. pusilla*

C'. The canal of the petiole commonly not separated from the canal of the rachis. Lower leaf surface without bristles. Fruit articles reticulate, due to the falling away of the smooth, villous epicarp. Wings yellow.

29. *A. Dardani*

26. *Arachis Giacomettii* Krapov., W.C. Gregory, Valls & C.E. Simpson

Fig. 2,26

Herba annua caule principali erecto ramis procumbentibus. Caulis, stipulae petiolique indumento setarum tenuum strictarum 2-3 mm longarum tantum obtectus. Folia quadrifoliolata foliolis apicalibus modice obovatis, foliolis basalibus ovalibus usque oblongis, epiphyllo laeve, glabro, hypophyllo glabro aut pilis paucis parvis appressis setisque nonnullis sparsim vestito, nervo medio manifesto, nervis secundariis margineque sat perspicuis, hoc et nervio medio pilis 1.5-2 mm longis setis nonnullis hirsutis. Flores dimorphi: parvissimi hipanthio brevissimo, 5 mm longo et flores normales hypanthio 2 cm longo, pilos longos valde disperse gerens, calyx 4-5 mm longus, villosus et large setulosus, vexillum 8 mm longum aurantiacum, supra subtusque lineis rubescentibus ornatum. Fructus subterraneus 2-(3)-articulatus, paxillo glabro ca. 10 cm longo, isthmo 2-5 cm longo, articulis 10-12 mm longis x 6-7 mm latis, epicarpio dense pilorum minutorum obtectis.

Holotype: BRAZIL. Minas Gerais. Mun. Montalvania, 8.5 km NW de Montalvania (desde o rio Coxá) na estrada para Pitarana, 14°21'S, 44°24'W, 630 m. Mancha de cerca de 50 m de extensão; cerdas douradas abundantes em todo o pecíolo; plantas com dominancia do eixo central que crescian na vegetação alta. 17-III-1992, Valls, Pizarro, Valente & Werneck 13202 (CEN). Isotype: CTES.

Annual herb. Taproot, weak. Hypocotyl 2-3 cm long x 4 mm in diameter. Mainstem erect, up to 60 cm long, with two basal vegetative branches, one or two successive nodes with short inflorescences and with one or two short apical branches; lateral branches procumbent, no secondary branches, with inflorescences on the basal nodes, internodes up to 6 cm long. Stem, stipules and petiole with indumentum made up solely of straight, slender bristles, 2-3 mm long, scattered. Stipules with the basal part fused, 15-18 mm long and narrow wings, 8-11 mm long and 1.5 mm wide at the base. Leaves tetrafoliolate, apical leaflets somewhat obovate and basal leaflets oblong, apiculate. Canal of the petiole very narrow, separated from the canal of the rachis by a transverse pilose prominence. On the mainstem, petioles up to 9 cm long and rachis up to 1 cm long, apical leaflets up to 44 mm long x 20 mm wide and the basal leaflets up to 42 mm long x 18 mm wide. On the branches, petioles up to 4.5 cm long and rachis 0.5 cm long, apical leaflets up to 35 mm long x 18 mm wide and the basal ones up to 32 mm long x 15 mm wide. Pulvinus villous; upper leaf surface smooth, glabrous;

lower surface glabrous or with a few small adpressed hairs and with some scattered bristles, with the midvein prominent and with the secondary veins somewhat marked; midvein and margin with long hairs 1.5-2 mm long and some scattered bristles. Flowers very small, with hypanthium very short, that later form pegs; exceptionally, larger flowers are present. Well-developed flowers have two basal bracts 5 mm long, with bristles; hypanthium 2 cm long, reddish, villous; calyx reddish, somewhat villous and with long straight bristles, 1 mm long, upper lobe 4 mm long, lower lobe falcate, 5 mm long. Standard 8 mm long, orange with red lines on both surfaces, wings yellow. Fruit subterranean, 2-(3)-articled; pegs glabrous, ca. 10 cm long, isthmus 2-5 cm long, articles 10-12 mm long x 6-7 mm wide, covered by a dense coat of hairs that strongly retains soil, without beak, the isthmus is borne near the middle of the ventral surface of the basal article. Seed 8-9 mm long x 4-5 mm wide, dark in color.

Additional material: BRAZIL. **Minas Gerais.** 8,5 km NW de Montalvania (desde o rio Coxá) na estrada para Pitarana, 630 m, plantas da população V.13202, mas com eixo central ereto muito longo e sem desenvolvimento dos ramos laterais, que vegetavam entremeadas com gramíneas altas. 17-III-1992, Valls & al. 13203 (CEN, CTES); id., I-1994 Werneck & al. 201 (CEN, CTES); 12 km de Montalvania, desde o río Coxá, em direção a Pitaranga, I-1994, Werneck & al. 178 (CEN, CTES).

We dedicate this species to Dr. Dalmo Catauli Giacometti, organizer and ex-director of the Centro Nacional de Recursos Genéticos (CENARGEN/EMBRAPA), Brasilia, who supported and greatly stimulated the explorations for *Arachis* germplasm in Brazil.

27. *Arachis sylvestris* (A. Chev.) A. Chev. Fig. 2,27

Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 9(96): 486, pl. 13, 1929 (aug). Chevalier, loc. cit. 13(146-147): 766, 1933.

Arachis hypogaea L. subsp. *sylvestris* A. Cheval., Compt. Rend. Hebd. Séances Acad. Sci. 188: 1511, 1929 (juin). Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 770, pl. 16, 1933.

Herbaceous annual. Taproot, weak. Mainstem erect, 4-15 cm long, without flowers, with two or four vegetative basal branches, covered by the stipules toward the apex. Lateral branches procumbent, up to 55 cm long, little or no further branching. Stems glabrescent toward the base, later villous, with long hairs up to 3 mm, more or less straight, and small curved and wavy hairs; internodes 10-40 mm long. Leaves tetrafoliolate. Leaves of the mainstem somewhat larger than those of the branches; fused portion of the stipules 8-10 mm long, the free portion 9-14 mm long x 1-2 mm wide, pointed; petiole 15-30 mm long, rachis 7-10 mm long; leaflets oblong, those of the basal pair 22-30 mm long x 10-14 mm wide, those of the apical pair 30-36 mm long x 13-17 mm wide. On the lateral branches, the fused portion of the stipules 6-7 mm long and the free portion 10-11 mm long x 1.5-2 mm wide, pointed; petiole 10-20 mm long; rachis 5-8 mm long; leaflets oblong to obovate, the basal ones up to 23 mm long x 14 mm wide and the apical ones up to 24 mm long x 15 mm wide. Stipules villous, with hairs ca. 3 mm long, more or less straight, and small, curly hairs. Petiole and rachis villous with the two types of hairs, sometimes with bristles on the back, the canal of both glabrous. Pulvinus with long hairs and small curly hairs. Upper surface of the leaflets with uniformly scattered hairs, 1-1.5 mm long; lower surface with hairs ca. 2 mm long, more or less adpressed, midrib prominent, with long hairs up to 3 mm and short curly hairs; secondary veins and margin barely marked, margin ciliate, sometimes thick bristles are present on the underside. Inflorescences few-flowered, axillary along the length of the prostrate branches. Hypanthium 40-50 mm long, reddish, villous, with scattered long hairs and short curly hairs. Calyx bilabiate, 4-5 mm long, with long hairs and short curly hairs, without bristles, after anthesis the upper lobe usually splits almost to the base. Standard 7 mm long, orange, with red lines convergent toward the base on the external surface, in dried specimens the entire standard acquires a

reddish tone; wings yellow. Fruit subterranean; pegs shallow, growing horizontally, some 20-25 cm long, villous on the aerial part; isthmus 6 cm long; articles 10-20 mm long, smooth, with a small beak, covered with a dense mat of short hairs. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Holotype: BRAZIL. Bahia. 1929, leg. Bondar (P!). "... vallée du rio São Francisco, sur les sables d'alluvion. Elle est connue comme l'Arachide sous le nom de Mundubi" (Chevalier 1929b: 486).

Selected additional material: BRAZIL. **Bahia.** 4 km E de Barreiras, road to Passagem and Ibotirama, 500 m, 6-III-1971, Irwin & al. 31651 (NY, UB); id., 5-V-1982, Valls & al. 6767 (CEN, CTES); Barreiras, patio del Hotel Barreiras, 12°19'S, 45°W, 450 m, 31-III-1983, Valls & al. 7037 (CEN, CTES); Barreiras, balneario do rio de Ondas, 15-IV-1983, Valls & al. 7294 (CEN, CTES); 12 km N de Riachão das Neves, 11°30'S, 49°55'W, 1-IV-1983, Valls & al. 7060 (CEN, CTES); 16 km N do rio Cariparé, estrada Riachão das Neves a Formosa do Rio Preto, 1-IV-1983, Valls & al. 7065 (CEN, CTES); 200 m N da saída para Santa Rita de Cassia, estrada de Barreiras para Corrente, 11°20'S, 44°56'W, 1-IV-1983, Valls & al. 7071 (CEN, CTES); 12 km W de Formosa do Rio Preto, 11°3'S, 45°17'W, 2-IV-1983, Valls & al. 7076 (CEN, CTES); Formosa do Rio Preto, 2-IV-1983, Valls & al. 7079 (CEN, CTES); 200 m N do riacho Piripiri, Estrada de Formosa a Corrente, 10°55'S, 45°14'W, 24-IV-1983, Valls & al. 7081 (CEN, CTES); 1 km N do Pindobaçu, estrada para Senhor do Bonfim, 10°44'S, 40°21'W, Valls & al. 6180 (CEN, CTES); id., 19-IV-1987, Valls & al. 10891 (CEN, CTES); id., 10892 (CEN, CTES). **Ceará.** Sin localidad, 1859, Allemao & al. 364 (R); sin localidad, 1860-61, Allemao (P); 19,7 km leste de Barbalha, camino a Missão Velha, 22-IV-1987, Valls & al. 10922 (CEN, CTES); id., 10932 (CEN, CTES); id., 10933 (CEN, CTES); 3,9 km a leste do rio Cauipe, entre Guaruru e Catuana, BR-222, 28-IV-1987, Valls & al. 10993 (CEN, CTES); 4 km W do rio Cauipe, BR-222, 28-IV-1987, Valls & al. 11000 (CEN, CTES); Ibiapaba, Unidade de Pesquisa de Ibiapaba/EPACE, 30-IV-1987, Valls & al. 11020 (CEN, CTES). **Goiás.** Mun. Formosa: 1,5 km S da vila JK (BR-020), 15°12'S, 47°10'W, 10-VI-1981, Valls & al. 6001 (CEN, CTES); id., 21-III-1982, Valls & al. 6668 (CEN, CTES); id., 3-V-1982, Valls & al. 6744 (CEN, CTES); id., 29-III-1983, Valls & al. 7002 (CEN, CTES). **Maranhão.** Timon, 10 km W del puente a Teresina, Fazenda Bandeirante, 31-I-1981, Krapovickas & al. 37215 (C, CEN, CTES, F, G, INPA, IPA, K, LIL, MO, NY, P, US); 7-8 km W del puente a Teresina, 28-I-1981, Krapovickas & al. 37191 (CTES, F, G, HGB, IPA, K, LIL, MBM, MO, NY, RB, SP, UB, US); 8 km de Teresina, perto do fronteira com Piauí, 31-I-1981, Pires & al. 17361 (CTES, MG); Timon, 9,5 km W da ponte sobre o rio Parnaíba, 24-III-1985, Valls & al. 8491 (CEN, CTES); Estereito, 16-III-1985, Valls & al. 8345 (CEN, CTES); 9,5 km ao N de Carolina na estrada para Estreito, 17-III-1985, Valls & al. 8373 (CEN, CTES); 60 km E de Carolina, BR-230, 18-III-1985, Valls & al. 8386 (CEN, CTES); 20 km SW de Riachão, BR-230, 18-III-1985, Valls & al. 8392 (CEN, CTES); 6 km NE de Balsas, BR-230, 19-III-1985, Valls & al. 8403 (CEN, CTES). Mun. Loreto: Ilha de Balsas region, 35 km S of Loreto, Veados, 7°23'S, 45°7'W, 5-IV-1962, Eiten & al. 4005 (NY); 18 km SW de São Raimundo, BR-230, 19-III-1985, Valls & al. 8417 (CEN, CTES); São Raimundo das Mangabeiras, rio Neves, 19-III-1985, Valls & al. 8422 (CEN, CTES); 1,2 km NE da torre repetidora de televisao da saida leste de São Raimundo, BR-230, 20-III-1985, Valls & al. 8423 (CEN, CTES); 70 km NE de São Raimundo, BR-230, 20-III-1985, Valls & al. 8435 (CEN, CTES); São Domingos, BR-230, 20-III-1985, Valls & al. 8437 (CEN, CTES); 27 km NE de Pastos Bons, 21-III-1985, Valls & al. 8442 (CEN, CTES); 7 km W de São João dos Patos, BR-230, 21-III-1985, Valls & al. 8444 (CEN, CTES); 25 km E de São João dos Patos, BR-230, 21-III-1985, Valls & al. 8451 (CEN, CTES). Mun. Caxias: 58 km NE da ponte sobre o rio Parnaíba, BR-316, 24-III-1985, Valls & al. 8494 (CEN, CTES). **Minas Gerais.** Rio Jequitaí, just S of Jequitaí, 17°14'S, 44°26'W, 21-IV-1982, Valls & al. 6676 (CEN, CTES); Pirapora, rio São Francisco, 11-I-1989, Krapovickas & al. 42867 (CEN, CTES). **Paraiba.** Em terrenos arenosos e xerofíticos, 25-V-1959, Moraes 2127 (NY, P, US). **Pernambuco.** Serra Talhada, V-1971, Heringer 11996 (CTES, US). **Piauí.** Sin localidad, 1883, Netto 27 (R); km 84, estrada Teresina-Campo Maior, 8-III-1968, Andrade-Lima 68-5329 (CTES, IPA). Mun. Amarante: BR-343, entre Teresina e Floriano, km 40, 25-V-1980, Coradin 2605 (CEN, CTES). Mun. Corrente: 500 m S da ponte sobre o rio Corrente, BR-135, 10°27'S, 45°10'W, 460 m, 3-IV-1983, Valls & al. 7105 (CEN, CTES); 11 km N do rio Corrente, BR-135, 490 m, 4-IV-1983, Valls & al. 7123 (CEN, CTES). Mun. Barreiras do Piauí: 39 km S of Gilbués, BR-135, 10°8'S, 45°13'W, 4-IV-1981, Valls & al. 7126 (CEN,

CTES). Mun. Gilbués: 5 km S de Monte Alegre do Piauí e 7 km N de Gilbués, BR-135, 520 m, 4-IV-1983, Valls & al. 7130 (CEN, CTES). Mun. Nazaré do Piauí: 7 km E de Nazaré do Piauí, BR-230, 300 m, 7-IV-1983, Valls & al. 7176 (CEN, CTES). Mun. Oeiras: 3 km W de Oeiras, 200 m, 8-IV-1983, Valls & al. 7180 (CEN, CTES); acesso ao aeroporto de Oeiras, 8-IV-1983, Valls & al. 7191 (CEN, CTES); Altos, BR-343, km 311, 23-III-1985, Valls & al. 8475 (CEN, CTES); 13 km NE de Altos, BR-343, 23-III-1985, Valls & al. 8477 (CEN, CTES); 5,5 km N de Itaueira, PI-140, 27-III-1985, Valls & al. 8516 (CEN, CTES); 35 km NE de Cristino Castro, BR-135, 27-III-1985, Valls & al. 8520 (CEN, CTES); Piripiri, 700 m SW do Rio dos Matos, 30-IV-1987, Valls & al. 11027 (CEN, CTES). **Rio Grande do Norte.** Mun. Caicó: km 17 da BR-427, a 10 km de Acari, em direçao a Currais Novos, 24-IV-1987, Valls & al. 10969 (CEN, CTES). Mun. Açu: 8,2 km W de rio Açu, a W de Açu, BR-304, 25-IV-1987, Valls & al. 10980 (CEN, CTES). **Tocantins.** 2 km S de Guarai, BR-153, 8°51'S, 48°31'W, 7-III-1982, Valls & al. 6547 (CEN, CTES). Mun. Tocantinópolis: BR-226, km 1192 (56 km NE de Vanderlandia), 6°38'S, 47°34'W, Valls & al. 6575 (CEN, CTES).

Common name. "mundubi" (Bondar 1929); "mundubi do Joazeiro" (Otero 1952: 179); "amendoim do porco" (Valls & al. 7191); "mandubi do porco" (Valls & al. 7172); "mundubim bravo" (Valls & al. 8458).

Geographic distribution. This is one of the most widely distributed species in the northeast of Brazil, forming very small populations (Valls 6180 and 6547), or covering very broad areas, with invasive tendencies (Krapovickas 37215 and Valls 7076). It grows in dry places, in the "caatinga" as well as in the "cerrado," in loose sandy soils, red or grey, preferring shady spots, especially when found in undisturbed areas.

Obs. 1. There exists a questionable specimen: Brazil, São Paulo, Campo do Bocaina, common name "amendoim bravo," 8-IX-1879, Glaziou 10513 (P), which corresponds very well with *A. sylvestris*, but was collected outside the range of that species. It has been pointed out (Wurdack 1970: 911) that Glaziou was in the habit of altering the labels of other collectors and using them for other specimens by changing the locations and naming Glaziou as the collector. Among the collectors involved in this operation is Fr. Allemao, from whom there exists a specimen from Ceará in the Museum National d'Histoire Naturelle, Paris.

Obs. 2. Bondar (1929), in an account of a trip to the municipality of Juazeiro (Bahia) in December 1925, talks about "mundubi," a leguminous creeper that develops extraordinarily well in the rainy season. The plant sent to Hoehne in São Paulo was identified as *Meibomia incana* Sw. The cuttings planted in Bahia did not do well; they produced flowers and then died, but it was verified that the plant buries its fruits in the same manner as "amendoim."

Chevalier (1929b: 496) transcribed a good portion of this article byBondar, so it is very presumable that the type locality of *A. sylvestris* is Juazeiro, in the state of Bahia, "on deep soil, formed from calcareous silt, that cracks deeply in the dry season" (Bondar 1929: 9).

Obs. 3. The specimen Valls 6676, from Jequitaí (MG), has somewhat different flowers, whose standard, instead of having reddish lines in the dorsal surface, has greenish lines. The specimen Krapovickas 42867, from Pirapora (MG), is very similar, but because it has only tiny flowers it is not possible to observe the color of the corolla. It is interesting to note that both specimens grow in the southern extreme of the range of *A. sylvestris*.

Obs. 4. In *A. sylvestris* it is common to find very visible, abundant hairs on the upper surface of the leaflets, making its identification easy. Nevertheless, there are some specimens, coming from the vicinity of Floriano, on the Parnaiba River, in the central part of Piauí, that have a completely glabrous upper leaf surface. In some specimens (Valls 7144), a little more distant, the indumentum of the upper leaf surface varies from glabrous to pilose. We identify this material as *A. sylvestris* because its flowers have a standard with reddish lines on the dorsal surface.

Material studied with a glabrous upper leaf

surface: BRAZIL. **Maranhão.** Mun. Barão do Grajaú: 100 m W da ponte sobre o rio Parnaiba, na estrada BR-230, para Floriano (Piauí), junto ao marco inaugural do ponte, 140 m, 6°46'S, 43°1'W, 7-IV-1983, Valls & al. 7156 (CEN, CTES, G, K, MO, NY, US); id., 22-III-1985,Valls & al. 8458 (CEN, CTES). **Piauí.** Mun. Floriano: 1 km a leste da ponte sobre o rio Parnaíba, 170 m, 7-IV-1983, Valls & al. 7165 (CEN, CTES, F, P, US); id., 22-III-1985, Valls & al. 8461 (CEN, CTES); 7 km da BR-343, a partir da BR-230, 22-III-1985, Valls & al. 8466 (CEN, CTES); 16 km S de Floriano, PI-140, 27-III-1985, Valls & al. 8511 (CEN, CTES). Mun. Manuel Emiaio: 35 km NE de Cristino Castro, BR-135, 310 m, 8°36'S, 44°W, 5-IV-1983, Valls & al. 7144 (CEN, CTES, G, K, NY); id., 27-III-1985, Valls & al. 8519 (CEN, CTES). Mun. Nazaré do Piauí: 300 m N do acesso leste de Nazaré, BR-230, 210 m, 6°50'S, 42°41'W, 7-IV-1983, Valls & al. 7172 (CEN, CTES).

28. *Arachis pusilla* Benth.

Fig. 2,28

Bentham, Trans. Linn. Soc. London 18(2): 159, 1841, "*In Serra Jacobina provinciae Bahia, Brasiliae, Blanchet* 2669." Bentham, Martius, Fl. bras. 15(1): 86, 1859. Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 9(90): 99, 1929. Chevalier, loc. cit. 13(146-147): 765, 1933. Burkart, Darwiniana 3(2), lám. 21, 1939. Hermann, Agric. Monogr. USDA 19: fig. 24, 1954. Krapovickas & Rigoni, Darwiniana 11(3): 449-450, obs. 1, 1957.

Annual plant. Root small, 10-15 cm deep, with very thin branches. Mainstem erect, 5-20 cm long; lateral branches (n+1) procumbent, up to 80 cm long, with two short vegetative branches at the base, with very few or no subsequent (n+2) vegetative branches. Internodes 1-4 cm long, angular, more or less villous, with rigid hairs ca. 2 mm long, and scattered short, somewhat curly hairs. Leaves tetrafoliolate, those of the mainstem somewhat larger and with the petioles noticeably longer than those of the lateral branches. On the mainstem, the fused portion of the stipules 7-10 mm long and the free portion 11-17 mm long; petiole 50-90 mm long; rachis 11-15 mm long; leaflets elliptical, the apical 24-36 mm long x 9-15 mm wide, the basal 22-30 mm long x 7-12 mm wide. On the lateral branches, the fused portion of the stipules 5-8 mm long, the free portion 10-12 mm long; petiole 15-35 mm long, rachis 5-9 mm long; leaflets ovate, the apical 15-20 mm long x 8-11 mm wide, the basal 13-17 mm long x 7-9 mm wide. The stipules with thickened back, prominent veins and papery wings, free at the base (without forming a tube), free ends acute, single-veined, narrowing abruptly, with very short hairs and long hairs (2 mm) scattered on the back, wings subglabrous, margin long ciliate. Petiole and rachis with a very narrow canal, back with short, somewhat wavy hairs and scattered long, erect hairs; petiole-rachis canal interrupted at the level of the first pair of leaflets by a transverse line of long, compressed hairs. Upper surface of the leaflets smooth, glabrous; the lower surface with veins and margin softly marked, with scattered adpressed hairs; in young leaves there are also somewhat more erect, long hairs; margin densely ciliate with the hairs strongly directed toward the apex. Inflorescences few-flowered, very short, along the length of the branches and also present on the mainstem. Flowers dimorphous, with very small flowers 2-3 mm long with hypanthium 3-10 mm long, and normal flowers with hypanthium 4-5 cm long, villous. Calyx villous, including some long bristles; narrow lobe subfalcate, 6 mm long, the wide lobe 5 mm long. Standard ca. 10 mm long, yellow-orange, with reddish lines on both faces; wings yellow, with orange apex. Fruit biarticulate, peg horizontal, 4-20 cm long, violet and villous upon emergence, later glabrous; isthmus 0.5-4 cm long; articles 10-13 mm long x 6-8 mm wide, the apical article somewhat larger; pericarp smooth, covered by a dense cloak of diminutive hairs. Seeds with ocherous integument, completely filling the articles. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Holotype: BRAZIL. Bahia. Serra Jacobina, Blanchet 2669 (K!). Isotypes: G!, P!.

Selected additional material: BRAZIL. **Bahia.** 38,1 km NE de Ibotirama, camino a Seabra, 12°02'S, 42°57'W, 16-IV-1987, Valls & al. 10837 (CEN, CTES).

Mun. Barra: BR-242, 11 km W da ponte sobre o rio São Francisco, 12°12'S, 43°20'W, 16-IV-1987, Valls & al. 10833 (CEN, CTES). Mun. Paratinga: 21,2 km S de Ibotirama na estrada para Paratinga, 12°21'S, 43°13'W, 360 m, 14-III-1981, Valls & al. 6110 (CEN, CTES); id., flores diminutas, 19-III-1982, Valls & al. 6655 (CEN, CTES, G, K, LIL, MBM, NY, P, SI, US); id., flores normales e diminutas, 14-IV-1983, Valls & al. 7287 (BAB, CEN, CTES, F); 42,8 km S de Ibotirama na estrada Paratinga, 7-V-1982, Valls & al. 6773 (CEN, CTES); id., 14-IV-1983, Valls & al. 7289 (CEN, CTES); 13 km S de Paratinga na estrada para Bom Jesus da Lapa, 7-V-1982, Valls & al. 6781 (CEN, CTES). Mun. Bon Jesus da Lapa: 14 km a leste do rio Corrente na estrada de Santa Maria da Vitoria a Bom Jesus da Lapa, 13°23'S, 44°05'W, 450 m, 9-V-1982, Valls & al. 6785 (CEN, CTES). **Ceará.** Mun. Missão Velha: 19,7 km a leste de Barbalha, camino a Missão Velha, 7°15'S, 39°10'W, 22-IV-1987, Valls & al. 10921 (CEN, CTES). **Minas Gerais.** Mun. Coronel Murta: 8,2 km S do rio Jequitinhonha, na estrada de Coronel Murta a Araçuai, 16°41'S, 42°10'W, 23-IV-1982, Valls & al. 6709 (CEN, CTES). **Piauí.** Mun. Piracuruca: margem esquerda do rio Genipapo, no lado norte da BR-222, km 26,4, 3°59'S, 41°24'W, Valls & al. 11022 (CEN, CTES).

Common name. "amendoim de caracará" (Valls & al. 7287).

Geographic distribution. This species was collected in the state of Bahia on both sides of the São Francisco River, where it grows in open areas in presence of the palm *Copernicia cerifera*. It was also collected in the north of Minas Gerais, near the Jequitinhonha River, in the south of Ceará and the north of Piauí.

Obs. The type specimen, Blanchet 2669, consists of various very young individuals, analyzed in detail by Krapovickas & Rigoni (1957: 449). We have not personally collected this species at the type locality. At present, the above cited specimens are those that most closely approximate the type of *A. pusilla* for the glabrous upper surface of leaves, with orderly bristles on the lower surface, and for the transverse line of hairs at the first pair of leaflets, characters clearly visible on the Blanchet 2669 specimen.

29. *Arachis Dardani* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,29; 17

Herba annua vel biennis. Caulis angulosus, villosus, principalis erectus, rami procumbentes. Stipulae pilis longis cupreis sparsim vestitae, apicibus liberis trinervibus glabris, margine longe ciliatae. Foliola ovalia vel aliquanto obovata, utrinque acuta, epiphyllo laevi, glabro, hypophyllo fere laevi, pilis longis sparsim vestito, margine ciliato. Hypanthium 2-7 cm longum, pilos longos valde disperse gerens. Calyx 4-5 mm longus, pilis longis cupreis plus minusve dense vestitus. Vexillum 7-9 mm longum x 8-10 mm latum, velutino-aurantiacum, supra subtusque lineis rubescentibus ornatum. Fructus biarticulatus paxillo usque ad 30 cm longo, isthmo 6-9 cm longo, articulis 10-13 mm longis x 6-7 mm latis, epicarpio dense pilorum minutorum obtectis, iis decisis reticulatio insignis pericarpii conspicua.

Holotype: BRAZIL. Pernambuco. Mun. São Lourenço da Mata, Engenho São Bento, Tapera, 15-IV-1967, Gregory & Krapovickas 12946 (IPA). Isotypes: CEN, CTES, EAC, G, GH, K, LIL, MO, NY, P, RB, SI, SP, US.

Annual or biannual plant. Taproot with weak branchings. Mainstem erect, 5-15 cm long, but capable of attaining 35 cm in length when growing in competition with tall grasses. Lateral branches prostrate, up to 70 cm long. Stem angled in the young parts, cylindrical toward the base, with more or less dense, coppery hairs ca. 1.5 mm long. The mainstem without flowers. On the primary lateral branches, the vegetative and reproductive branches alternate, with a predominance of the latter, which are more abundant on the secondary branches. Leaves tetrafoliolate, those of the mainstem always larger than those of the lateral branches. On the mainstem, the fused portion of the stipules 10 mm long, the free parts acicular, 15-20 mm long; petiole 30-42 mm long; rachis 10-12 mm long; leaflets elliptic or somewhat obovate, acute toward the ends, the apical pair up to 36 mm long x 22 mm wide, the basal pair up to 33 mm long x 20 mm wide.

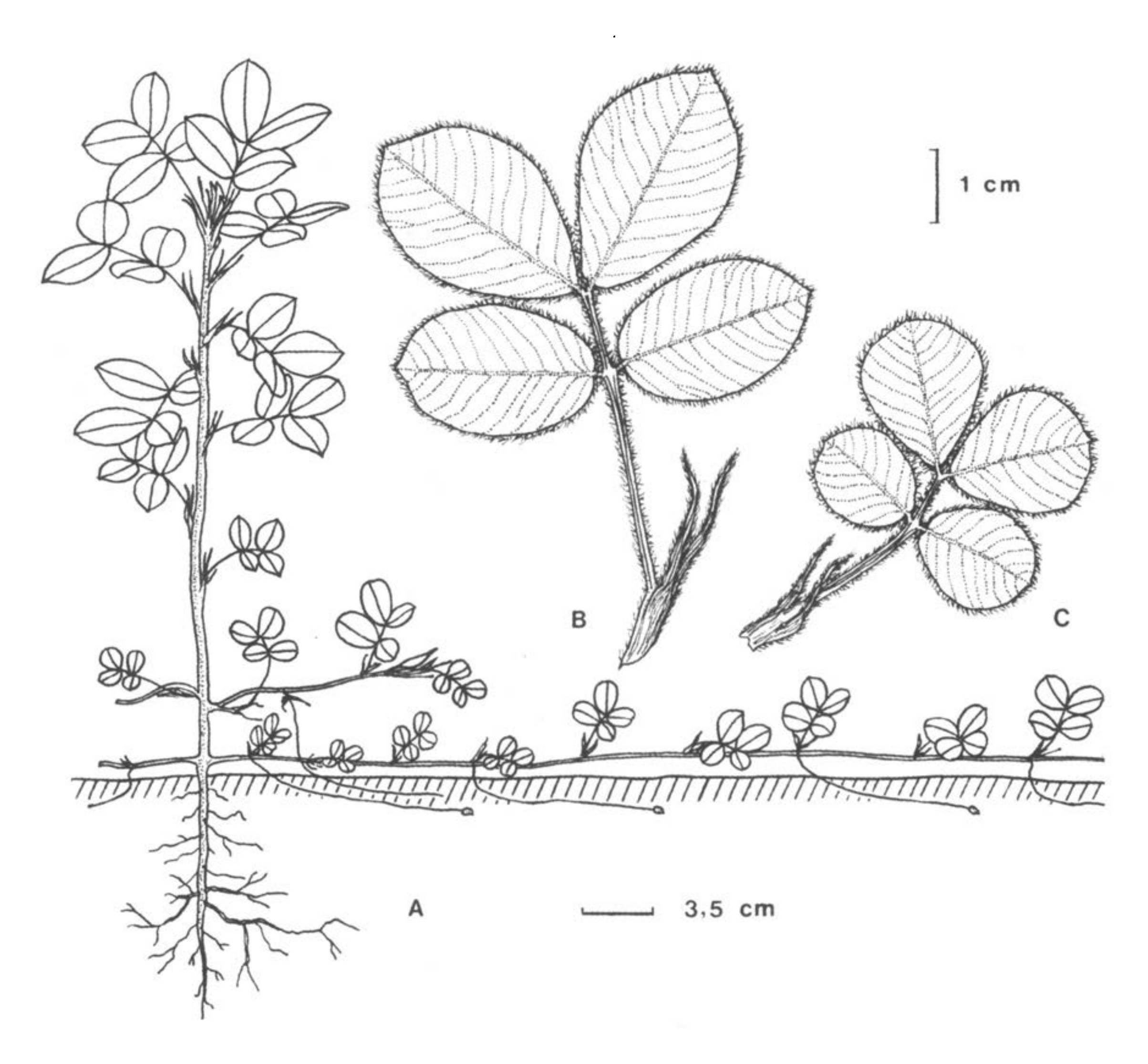


Fig. 17. *Arachis Dardani*: A, schematic of the plant; B, leaf from mainstem; C, leaf from lateral branch (G.12946).

On the lateral branches, the fused portion of the stipules 5-6 mm long, the free parts acicular, 10-13 mm long; petiole 15-21 mm long; rachis 8 mm long; leaflets rounded, broad, obovate, the apical pair up to 25 mm long x 19 mm wide, the basal pair up to 20 mm long x 15 mm wide. Stipules with scattered long coppery hairs toward the base of the fused portion; the free portion 3-veined, with glabrous surfaces and the margin longly ciliate. Petiole canaliculate, dorsal surface with long coppery hairs, similar to those of the stem; canal glabrous or with some short hairs, open, almost flat toward the apex, the separation from the rachis canal usually without the transverse line of hairs, which are present at the level of the apical pair of leaflets. Leaflets with upper surface glabrous, the lower surface with long scattered hairs and with small, scarcely visible adpressed hairs; veins weakly marked on the lower surface and with faint marginal vein; margin ciliate. Flowers along the length of the prostrate branches, in short 3-4-flowered spikes. Hypanthium 2-7 cm long, with very scattered silky hairs. Calyx bilabiate, with long coppery, more or less dense hairs, upper lobe 4-5 mm long, lower lobe subfalcate, acute, 4-4.5 mm long. Standard 7-9 mm long x 8-10 mm wide, yellow-orange, with reddish-violet lines on both faces; wings yellow, 6-7 mm long.

Fruit subterranean, biarticulate; peg usually 10-14 cm long but up to 30 cm long; isthmus 6-9 cm long; articles well-developed, 10-13 mm long x 6-7 mm wide, covered with a dense coat of diminutive hairs which when removed reveals a somewhat prominent reticulum; the peg is inserted on the dorsal side, toward the base of the articles and the isthmus is borne at the apex on the ventral side, forming a small beak. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Selected additional material: BRAZIL. S/l., Löfgren 77 (R); Löfgren 128 (R). **Alagoas.** Porto Real do Colegio, VIII-1929, Deslandes 69 (SP). **Bahia.** Barreiras, 31-III-1983, Valls & al. 7039 (CEN, CTES); 11 km N de Riachão das Neves, 11°40'S, 44°55'W, 1-IV-1983, Valls & al. 7055 (CEN, CTES); 12 km N de Riachão das Neves, 1-IV-1983, Valls & al. 7062 (CEN, CTES); id., 7063 (CEN, CTES). **Ceará.** Mun. Santa Quiteria: CE-032, km 113, Sobral-Caninde, 15-VI-1979, Coradin & al. 1963 (CEN, CTES); Baturité, 11-IV-1909, Ducke 1970 (MG, RB); Jucas, 6°32'S, 39°32'W, 250 m, 1-III-1972, Pickersgill RU72-259 (CEN, CTES, IPA, US); Sobral, Praça Fernando Mendes, 12-IV-1967, Gregory & al. 12943 (CEN, CTES, EAC, GH, MO, NY, US); id., 12945 (CTES, EAC, G, GH, IPA, LIL, MO, NY, US); 50 km E de Sobral, 12-IV-1967, Gregory & al. 12939 (CEN, CTES, EAC, GH, MO, NY, US); 40 km E de Sobral, 12-IV-1967, Gregory & al. 12941 (CEN, CTES, EAC, G, GH, K, MO, NY, P, US); 12 km NW of Senador Pompeu, 5°40'S, 39°25'W, 3-III-1972, Pickersgill & al. RU72-282 (CEN, IPA, US); 5 km from Campos Sales on the road to Crato, 7°10'S, 40°20'W, 19-II-1972, "amendoim carcará," Pickersgill RU72-186 (CEN, CTES, US); Brejo Santo, 2,8 km S de Brejo Santo, BR-116, 7°31'S, 39°00'W, 350 m, 21-IV-1987, Valls & al. 10912 (CEN, CTES); Brejo Santo, 28 km S de Brejo Santo, BR-116, 7°31'S, 38°00'W, 21-IV-1987, Valls & al. 10913 (CEN, CTES); Barro, km 461,5 da BR-116, ao longo da zona urbana de Barro, 7°11'S, 38°47'W, 330 m, 22-IV-1987, Valls & al. 10936 (CEN, CTES); Aracati, 1,6 km a leste do inicio da ponte sobre o rio Jaguaribe, BR-304, 4°34'S, 37°47'W, 26-IV-1987, Valls & al. 10988 (CEN, CTES). Mun. Beberibe: 2,2 km NW do entroncamento das rodovias BR-304 e BR-116, entre Aracati e Cristais, 4°35'S, 38°13'W, 26-IV-1987, Valls & al. 10992 (CEN, CTES); Caucaia, 4 km o oeste do rio Cauipe entre Guaruru e Catuana, BR-222, 3°41'S, 38°53'W, 28-IV-1987, Valls & al. 11001 (CEN, CTES); Itapagé, 9,3 km o oeste da estrada para Pitombeiras entre Umirim e Itapagé ao longo da BR-222, 3°45'S, 39°32'W, 28-IV-1987, Valls & al. 11006 (CEN, CTES); Sobral, 14,2 km a oeste do rio Jaibaras e 900 m a leste da estrada para Jaibaras e Cariré ao longo da BR-222, 3°44'S, 40°28'W, 29-IV-1987, Valls & al. 11008 (CEN, CTES); Frecheirinha, margem oeste do rio Caiçara ao longo da rodovia BR-222 (lado norte) 3°46'S, 40°47'W, 29-IV-1987, Valls & al. 11016 (CEN, CTES). **Maranhão.** Pastos Bons, 27 km a NE de Pastos Bons e 2 km a SE de Orozimbo ao longo de BR-230, 21-III-1985, Valls & al. 8440 (CEN, CTES). **Pará.** Ilha do Marajó, Rio Camará, fazenda Sta. Rita, Retiro Pau Grande, III-1950, Lima 72 (IAN, SI, US). **Paraíba.** Mun. Sousa: 900, 6°47'S, 38°12'W, 23-IV-1987, Valls & al. 10939 (CEN, CTES); Sousa, 3,7 km W da ponte sobre o rio Peixe ao longo da BR-230, 6°47'S, 38°7'W, 180 m 23-IV-1987, Valls & al. 10940 (CEN, CTES); Sousa, 400 m W da ponte sobre o rio do Peixe, na chegada a Aparecida, 6°47'S, 38°6'W, 23-IV-1987, Valls & al. 10945 (CEN, CTES); Sousa, 7,7 km E da ponte sobre o rio do Peixe em Aparecida ao longo da BR-230, 6°46,5'S, 38°2'W, 23-IV-1987, Valls & al. 10946 (CEN, CTES); Pombal, 3,5 km W da ponte sobre o rio Piranhas na BR-230, entre Aparecida e Pombal, 6°43'S, 37°50'W, 24-IV-1987, Valls & al. 10947 (CEN, CTES); Pombal, 11,6 km NE de Pombal, BR-427, 6°45'S, 37°42'W, 210 m, 23-IV-1987, Valls & al. 10953 (CEN, CTES); Paulista, cerca de 700 m da divisa Paraiba/Rio Grande do Norte, BR-427, 6°40'S, 37°31'W, 230 m, 23-IV-1987, Valls & al. 10960 (CEN, CTES); s/l., regioes secas, 19-IV-1959, Moraes 2088 (NY, P, US); Souza, Posto Agricola de São Gonçalo, varzea, 5-III-1936, Luetzelburg 26889 (CEN, IPA, NY). **Pernambuco.** Fazenda Cachoeirinha (mun. Mirandiba), km 447 da BR-232, entre Salgueiro e Bom Nome, 8°1'S, 38°49'W, 20-IV-1981, Valls & al. 6215 (CEN, CTES); Tapera, 17-VI-1932, Pickel 3031 (CEN, P, US). Mun. São Lourenço do Mata: Eng. São Bento, 6-V-1967, Andrade-Lima 67-5006 (IPA); Serra Talhada, Hotel Planalto, 8-V-1971, Heringer & al. 638 (CEN, CTES, IPA, UB); Estrada Salgueiro-Carqueja, Serra de São Gonçalo, 23-V-1971, Heringer & al. 865 (CEN, IPA, UB). **Piauí.** Dry shady places from Brejo Grande, Ceará, to the City of Oeiras, III-1839, Gardner 2091 (G, K, NY, P); 27 km a Leste de Oeiras, BR-230, 8-IV-1983, Valls & al. 7197 (CEN, CTES); km 3,3 da BR-407 na saida de Picos para Petrolina, 9-IV-1983, Valls & al. 7215 (CEN, CTES); Corrente, 10°26'S, 45°10'W, 3-IV-1983, Valls

& al. 7086 (CEN, CTES); Floriano, 9 km a Leste do rio Parnaiba, BR-230, 7-IV-1983, Valls & al. 7166 (CEN, CTES); Angical, faixa de dominio leste da BR-343 a 100 m ao norte da entrada da Estaçao Experimental de Angical da Embrapa, 22-III-1985, Valls & al. 8471 (CEN, CTES); km 151,7 da rodovia BR-316 cerca de 8 km ao norte de Elesbão Veloso, 26-III-1985, Valls & al. 8503 (CEN, CTES); 27 km a oese de Oieras ao longo da rodovia BR-230, 26-III-1985, Valls & al. 8505 (CEN, CTES); 16 km ao sul de Floriano na Rodovia PI-140 (distancia medida da estaçao rodoviaria), 27-III-1985, Valls & al. 8509 (CEN, CTES); Entrada norte de Corrente na BR-135, 28-III-1985, Valls & al. 8522 (CEN, CTES); Trevo de acesso a Amarante na rodovia BR-343, 22-III-1985, Valls & al. 8469 (CEN, CTES); 9 km a leste da ponte sobre o rio Parnaiba ao longo da rodovia BR-230, 22-III-1985, Valls & al. 8462 (CEN, CTES). **Rio Grande do Norte.** 35 km from Currais Novos on road to Cerro Cora, 6°10'S, 36°25'W, 400 m, "amendoim bravo," 21-III-1972, Pickersgill RU72-363 (CEN, CTES, IPA, US); BR-226, Santa Cruz-Currais Novos, km 4, 21-VII-1980, Coradin & al. 3224 (CEN, CTES); Faz. Castro between Acari and Cruzeta, 36°40'W, 6°22'S, 450 m, 23-III-1972, Pickersgill & al. RU72-374 (CEN, CTES, IPA, US); Caicó, 24,7 km a SE de Caicó, BR-427, 6°32'S, 36°56'W, 200 m, 24-IV-1987, Valls & al. 10963 (CEN, CTES); Caicó, km 17 da BR-427 a 10 km de Acari em direçao a Currais Novos, 6°21'S, 36°37'W, 210 m, 14-IV-1987, Valls & al. 10968 (CEN, CTES); Currais Novos, 15 km NE de Currais Novos, BR-427, 6°12'S, 36°24'W, 24-IV-1987, Valls & al. 10972 (CEN, CTES); Currais Novos, 2,7 km E de Riachuelo, na BR-304, 5°49'S, 35°48'W, 25-IV-1987, Valls & al. 10974 (CEN, CTES); Mossoró, 4,8 ao N de Mossoró, BR-304, 5°7'S, 37°20'W, 30 m, 26-IV-1987, Valls & al. 10981 (CEN, CTES). **Sergipe.** Maroim, X-1948, Moreno (SP 64272).

Geographic distribution. This is a species restricted to the northeast region of Brazil, where it grows mostly in the wooded "caatinga," frequently in low-lying areas with "carnaúba" palms. The southernmost collection was made in Barreiras (12°10'S), in the state of Bahia.

The specimen collected on Marajó Island, in the mouth of the Amazon River (Lima 72), we assign to this species with some reservations, due to the fact that we only had access to the herbarium specimen and did not have an opportunity to observe the plant in nature.

Obs. *Arachis Dardani* is, genetically, a very isolated species. Hybrids were only obtained when it was crossed with two accessions of *A. paraguariensis* ssp. *paraguariensis*, of section *Erectoides*. The pollen fertility was very low in both cases (0.6 and 2%).

In crosses with *A. Macedoi*, of section *Extranervosae*, the hybrid obtained was also highly sterile.

A special situation arose in crosses between two distant accessions of this species, one from Sobral (CE) and the other from Tapera (PE). The reciprocal hybrids in both cases gave pollen stains of 20.5%, a very low result, especially in light of the fact that these two accessions show no significant morphological differences.

We dedicate this species to Dr. Dárdano de Andrade-Lima, expert on the flora of the "nordeste," who accompanied us during the search for the material that we designated as the type.

VI. *Sect. Caulorrhizae* Krapov. & W.C. Gregory *nov. sect.*

Fig. 7

Sect. Caulorhizae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 92, 1973, *nomen nudum*. Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973.

Plantae perennes. Radix non incrassata. Rami procumbentes ad nodos radicantes. Caules cavi. Folia quadrifoliolata. Fructus subterraneus biarticulatus pericarpio laevi.

Typus sectionis: *Arachis repens* Handro

Perennial plants. Taproot, without thickenings. Branches spreading, procumbent, rooting at the nodes. Stems hollow. Stipules with the margins free to the base. Leaves tetrafoliolate. Flowers along the length of the branches. Well-developed hypanthium, up to 10 cm long or more. Standard commonly

yellow, expanded. Fruit subterranean, biarticulate; pegs short, vertical or inclined; isthmus short, up to 5 cm long; articles single-seeded; pericarp smooth. 2n=20 chromosomes.

Geographic distribution. This section grows in the border area between the Brazilian states of Goiás, Bahia and Minas Gerais, reaching as far as the Atlantic coast, where the type specimen of *A. Pintoi* was collected.

Key for distinguishing the species

A. Leaflets more than 2.5 times longer than wide. Plants without bristles, except rarely a few on the petiole.

30. *A. repens*

A'. Leaflets less than two times longer than wide. Bristles present on the stems, stipules, petiole and rachis, frequently also on the underside of the leaflets.

31. *A. Pintoi*

30. *Arachis repens* Handro
Fig. 2,30

Handro, Arq. Bot. Estado São Paulo 3: 180-191, táb. 47, 1958. Conagin, Bragantia 21: 353, est. 7, figs. 6A, 14, 1962. Conagin, Bragantia 22: 128, fig. 1A (2n=20), 1963.

Trailing perennial. Root branched, without enlargements. Branches widely spreading, with adventitious roots at the nodes. In one-year-old plants, the mainstem without branches on the upper nodes, thin and flexible, bending toward the soil. Internodes 3-5 cm long, somewhat angular, with adpressed whitish, caducous hairs. Leaves tetrafoliolate. Stipules with the fused portion 6-10 mm long, wide, with imbricated margins completely enveloping the stem; the free portion usually shorter, narrowing abruptly from the base. Petiole 7-40 mm long; rachis 3-7 mm long. Leaflets elliptical to obovate, 20-35 mm long x 8-12 mm wide, apex mucronate; the apical pair always somewhat larger than the basal pair. Stipules glabrous or with some small hairs, adpressed toward the base, margin barely ciliate, with short hairs. Petiole and rachis canaliculate, with very scattered adpressed hairs to subglabrous, very rarely with some bristles. Pulvinus somewhat villous. Leaflets with upper surface glabrous; lower surface with very small adpressed hairs barely visible to subglabrous, midvein somewhat conspicuous, the rest almost smooth, margin very slightly marked, with some adpressed hairs or glabrous, with scarce short bristles. Inflorescences axillary, few-flowered, the very short axis covered by the base of the stipules. Hypanthium 3.5-11 cm long, with more or less long, adpressed hairs, somewhat more villous toward the top. Calyx bilabiate, ca. 7 mm long, covered with adpressed hairs and with long scattered bristles. Standard entirely yellow, 8-13 mm long x 16-17 mm wide; wings and keel yellow. Fruit subterranean, biarticulate; peg 5 cm long; isthmus 1.7-3.5 cm long; articles 8-13 mm long x 5-6 mm wide, with a small apical beak, pericarp smooth. 2n=20 chromosomes (Conagin 1962: 353).

Holotype: BRAZIL. Minas Gerais. Estaçao Engenheiro Dolabela (E.F.C.B.), margem do Rio Jequitahy. Cultivada em Deodoro, D.F., R. Janeiro, 20-XI-1941, Ramos Otero 2999 (SP 46152!).

Selected additional material: BRAZIL. **Minas Gerais.** Lagoa Santa, Warming 2998 (G); Faz. Jatoba, rio Jequitaí, 45 km from Pirapora to Jequitaí, 21-IV-1982, orange fl., Valls & al. 6673 (CEN, CTES); id., yellow fl., Valls & al. 6674 (CEN, CTES).

Cultivated material: BOLIVIA. **Pando.** Cobija, main plaza, 11-XI-1988, Williams 809 (CTES). BRAZIL. **Amazonas.** Campus Aleixo Manaus, cult. in sandy soil for lawn effect, 1-X-1973, Bisby 1265 (K); id., 28-VIII-1976, Davis & al. 60389 (UEC). **Mato Grosso do Sul.** Mun. Douradina: Bocajá, BR-163, cult. 15-II-1933, Hatschbach & al. 59057 (CTES, MBM). **Minas Gerais.** Sete Lagoas, Estac. exper., cult. proc. Eng. Dolabela, 2-V-1961, Gregory & al. 10538 (CTES, LIL). Belo Horizonte, Jardim Botanico, cult.?, 2-II-1978, Krapovickas & al. 33403 (CEN, CTES, F, G, MO, PAMG, SI, UC, US); Pirapora, cult. Hotel Canoeiros, 21-IV-1982, Valls & al. 6671 (CEN,

CTES). **Rio de Janeiro.** Deodoro, cultivada na Seçao Experimental de Agrostologia, origem: margem direita do rio Jequitai, Eng. Dolabela, Minas Gerais, 11-XII-1941, Otero 3059 (RIZ). **Rio Grande do Sul.** São Gabriel, Estac. Experim. cult., proced.: São Paulo, 22-V-1968, Hammons & al. 365 (CTES). **São Paulo.** Instituto de Botanica, cult., procedencia ignorada, 12-III-1957, Handro 686 (SP, US); Instituto de Botanica, cult. (same population as Handro 686), Eiten 2549 (K, UB); id., 2746 (K); Campinas, Instituto Agronômico, cult., proc.: Estac. Exper. Monte Alegre do Sul, SP, V-305, X-1955, Conagin 1 (IAC 18127); Matao, Inst. Pesquisas I.R.I., cult., 5-VI-1968, Hammons & al. 500 (CTES); Caraguatatuba, Barra do rio Juqueriqueré, Porto Novo, cult., 2-VI-1968, Hammons & al. 467 (CTES); Araras, Usina de S. João, en césped, cult.?, 17-XI-1978, Mroginski 796 (CTES, SP).

Common names. "amendoim rasteiro" (Otero 3059; Otero 1951: 178); "tepe colombiano" (Williams 809).

Geographic distribution. Apparently, the typical form of this species occupies a very small range, on the Jequitaí River, between Jequitaí and Engenheiro Dolabela, toward the north central part of Minas Gerais. Due to its ability to compete with weeds and to form a compact lawn, its cultivation has been promoted and has expanded widely.

Obs. *Arachis repens* has a strong genetic affinity with *A. Pintoi*, of the same section, and they produced hybrids with a high percentage of stained pollen (86.8%). The morphological differences between them are quite notable, especially between the two parents utilized in the crosses.

In crosses between different sections, hybrids were only obtained with *A. major* and *A. paraguariensis* ssp. *paraguariensis*, of section *Erectoides*. The fertility of these hybrids was very low.

31. *Arachis Pintoi* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,31; 18

A. Pintoi Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 121, 1973, *nomen nudum*. This refers to the specimen Gregory & Krapovickas 12787.

Herba perennis. Caulis reptantes ad nodos radicantes, teretes, cavi, setulas caducas gerentes. Stipulae dorso glabrae, margine ciliatae. Foliola obovata, epiphyllo glabro margine indistincto, hypophyllo sparsim setuloso, margine pilis sericeis et setulis paucis brevibus instructa. Hypanthium 3.5-9.5 cm longum, villosum. Calyx 5-6 mm longus, villosus, setulosusque. Corolla lutea[6]*, vexillo 11 mm longo x 13 mm lato. Fructus biarticulatus paxillo 5-32 cm longo, isthmo 1-8.5 cm longo, articulis 11-14 mm longis x 6-7 mm latis, pericarpio laevi.*

Holotype: BRAZIL. Bahia. Cruz das Almas, IPEAL, cult. procedente de Bahía, rio Jequitinhonha, cerca de Belmonte, Bahía, en bancos de arena, de semillas coleccionadas por Geraldo C.P. Pinto y Paulo D.T. Alvim, en abril 1954, 15°52'S, 39°6'W, 31-III-1967, Gregory & Krapovickas 12787 (CEN). Isotypes: CTES, G, GH, K, LIL, MO, NY, P, RB, SI, SP, US.

Perennial plant. Taproot, without enlargements. Stems erect at first, later prostrate, rooting at the nodes, cylindrical, angled when dry, with rigid caducous bristles. Stems distichous. Leaves tetrafoliolate. Stipules with the portion fused to the petiole 10-15 mm long x 3 mm wide, with rigid bristles on the back; the free portion 10-12 mm long x 2.5 mm wide at the base, with prominent longitudinal veins, both surfaces glabrous, margin with silky hairs. Petiole up to 6 cm long, canaliculate, with rigid bristles on the back, glabrous canal with fine silky hairs along the margins. Rachis 10-15 mm long, canaliculate, with a few bristles on the back. Pulvinus pubescent. Leaflets obovate, apical pair up to 50 mm long x 32 mm wide, basal pair up to 45 mm long x 28 mm wide; glabrous upper surface with scarcely marked margin; lower surface with scattered bristles, more abundant on the external semi-lamina (exposed in the folded leaf) of the basal leaflets; margin lightly marked, with silky hairs and some short bristles. Inflorescences 4-5-flowered axillary

[6] Error in original, appeared as *aurantiaca*.

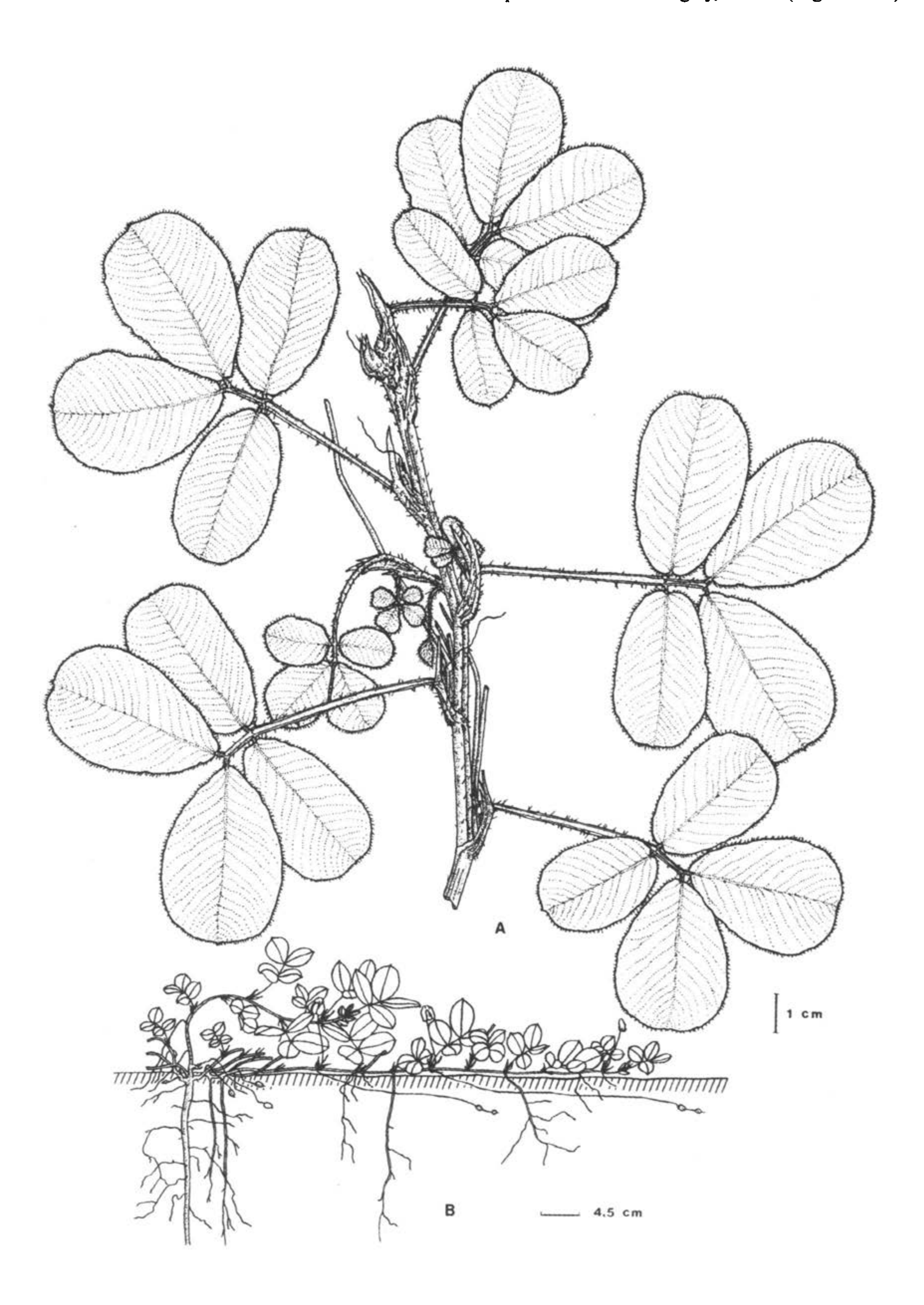


Fig. 18. *Arachis Pintoi*: A, branch; B, schematic of the plant (G.12787).

spikes, very short, covered by the fused portion of the stipules. Flowers sessile, protected by two bracts, the basal 12 mm long x 5 mm wide, with silky hairs along the midvein and on the margin, the upper bract bifid, 10 mm long x 2.5-3 mm wide, with silky hairs along the two veins and on the margin. Hypanthium 6.5 (3.5-9.5) cm long, with long silky hairs. Calyx bilabiate, with silky hairs somewhat more rigid than those of the hypanthium and with bristles; larger lobe 5 mm long, tridentate; upper lobe 6 mm long, narrow, falcate. Corolla yellow. Standard 11 mm long x 13 mm wide, with yellow veins; wings 8 mm long x 6 mm wide; keel 6-7 mm long, falcate. Four oblong anthers basifixed, four spherical anthers dorsifixed, and one staminode. Fruit biarticulate; peg 5-32.5 cm long, lightly pubescent toward the base; basal article somewhat smaller than the distal segment, 11-13 mm long x 6-7 mm wide; isthmus 1-8.5 cm long; distal article 12-14 mm long x 7 mm wide; pericarp smooth, covered with delicate hairs that retain the soil. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BRAZIL. **São Paulo.** Campinas, Instituto Agronômico, Fazenda Santa Elisa, adventicia, 1-II-1984, Valls & al.7529 (CEN, CTES); id., 21-I-1987, Krapovickas & al. 40986 (CTES).

Selected related material: BRAZIL. **Bahia.** Mun. Bom Jesus da Lapa: 74 km W of rio São Francisco on road from Bom Jesus da Lapa to Santa Maria da Vitoria, 8-V-1982, Valls & al. 6784 (CEN, CTES). **Goiás.** 120 km além de Formosa, na base de afloramento calcareo, prostrada e sendo pastada por gado, 22-X-1965, Heringer 10731 (CTES, NY); Vale do Paranã, Rio dos Macacos, 5-II-1967, Duarte 10313 (RB). Mun. Formosa: 12 km N-NW of Formosa, then 2 km into fazenda Jenipapo, rio Bandeirinha, 12-V-1982, Valls & al. 6791 (CEN, CTES); id., Valls & al. 6792 (CEN, CTES). **Minas Gerais.** 15 km N de Montalvania, 14°20'S, 44°20'W, 550 m, edge of lake, 18-III-1972, Anderson & al. 37175 (K, NY, US); Serra Cabral, 2 km N of Joaquim Felicio, 650 m, 5-III-1970, Irwin & al. 26986 (UB). Mun. Francisco Badaro: beira do córrego na saida da cidade para Berilo, 19-VII-1982, Werneck 17 (CEN); 3 km de Francisco Badaro na saida para Berilo, 17-VIII-1982, Werneck 34 (CEN). Mun. Araçuai: 1 km apos o rio Araçuai na estrada Araçuai-Virgem da Lapa, 28-IV-1982, Valls & al. 6727 (CEN, CTES); 8 km de Araçuai na estrada para Francisco Badaro, 28-IV-1982, Valls & al. 6728 (CEN, CTES). Mun. Presidente Juscelino: 3 km W of Rio Parauna, 85 km S of Diamantina, BR-259, 30-IV-1982, Valls & al. 6740 (CEN, CTES); id., Valls 6741 (CEN, CTES). Mun. Unai: ribeirao Lagoa do Mel, afluente do rio Preto, fazenda Palmital, 16°8'S, 47°13'W, 850 m, Werneck 1 & 2 (CEN); id., 18-II-1981, Valls & al. 5895 (CEN, CTES).

Geographic distribution. The typical form of this species is known only from the type locality. The forage qualities of this species has lead to its distribution for cultivation, apparently with great success.

Obs. 1. We have included in the description of this species material regarded as similar, albeit with reservations. This is a group that deserves special study. This additional material has some adpressed hairs, barely visible on the underside of the leaflets, in addition to the bristles. In contrast the type specimen has only the bristles, lacking the trichomes. Nevertheless, on the very young leaves of the type specimen, small adpressed hairs, evidently caducous, are found on the underside of the leaflets.

Obs. 2. This species is very much like *A. repens* for its rooting stems, hollow when dry, and for its yellow flowers. They are differentiated because in *A. Pintoi* the leaflets are larger, with a rounded tip, and there are bristles present on the stem, stipules, petiole and underside of the leaflets.

Obs. 3. Crosses with *A. repens* produced highly fertile hybrids (86.8%). In contrast, when crossing *A. Pintoi* with *A. major* and *A. paraguariensis* ssp. *paraguariensis* of the section *Erectoides*, and with *A. lignosa* and *A. Rigonii* of the section *Procumbentes*, the hybrids were highly sterile.

We dedicate this species to Ing. Agron. Geraldo C.P. Pinto, who collected and cultivated it.

VII. *Sect. Procumbentes* Krapov. & W.C. Gregory *nov. sect.*
Fig. 7

Sect. Erectoides ser. Procumbensae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 93, 1973, *nomen nudum.*

Perennes. Radix palaris. Rami procumbentes, rarissime decumbentes. Folia quadrifoliolata, saepe glabrae vel subglabrae. Vexillum aurantiacum vel luteum, supra lineis rubescentibus ornatum. Fructus subterraneus, biarticulatus, paxillo perlongo, paulum sub humo horizontaliter procurrenti, pericarpio laevi.

Typus sectionis: *Arachis Rigonii* Krapov. & W.C. Gregory

Perennial plants. Taproot, without thickenings. Branches procumbent, rarely decumbent. Leaves tetrafoliolate, generally glabrous or subglabrous. Stipules with free margins. Flowers along the length of the branches. Well-developed hypanthium. Standard expanded, yellow or orange, with reddish lines on the front. Fruit subterranean, biarticulate; peg and isthmus very extended, horizontal, shallow; articles smooth. 2n=20 chromosomes.

Geographic distribution. This section extends itself along the Paraguay River, from Concepción, on the Tropic of Capricorn, towards the north, flanking the Pantanal in Mato Grosso on the south and the north, and then expands westward as far as Santa Cruz de la Sierra, in Bolivia. Its species generally live in soils that are periodically flooded.

Obs. The position of its species is intriguing. In terms of their growth habit, *A. Rigonii* and *A. lignosa* appear to pertain to the section *Arachis* and *A. appressipila* to the section *Erectoides*, but the genetic behavior of these three species (see pages 173 and 177 in Gregory, M.P. & Gregory 1979) shows a greater affinity with the section *Erectoides*. Nevertheless, it is advisable to consider this as an independent section given that the fertility of the hybrids with species of other sections is always very low. Furthermore, there is a very notable cytological difference. In the species of section *Procumbentes*, the presence of a pair of chromosomes with a dot-shaped satellite has been detected, which is exclusive to this section (Fernández & Krapovickas 1994).

Key for distinguishing the species

A. Leaflets on the lateral branches with a length/width ratio less than 2:1.

B. Leaves small, leaflets of the lateral branches up to 19 mm x 10 mm, glabrous. Stems without adventitious roots. Standard orange.

32. *A. lignosa*

B'. Leaves larger.

C. Leaflets glabrous, up to 35 mm x 19 mm.

33. *A. Kretschmeri*

C'. Lower leaf surface with diminutive adpressed hairs.

D. Leaflets up to 30 mm x 17 mm. Corolla yellow. Stems without adventitious roots.

34. *A. Rigonii*

D'. Leaflets up to 24 mm x 18 mm. Standard orange. Stems with adventitious roots.

35. *A. chiquitana*

A'. Length/width ratio greater than 2.5:1.

E. Length/width ratio of 2.5-3.5:1.

F. Lateral branches procumbent, with leaflets up to 43 mm x 13 mm, glabrous. Stipules violet at the base.

36. *A. matiensis*

F'. Lateral branches decumbent, with leaflets up to 50 mm x 16 mm, with the upper surface glabrous and the underside with adpressed hairs. Stipules green.

37. *A. appressipila*

E'. Length/width ratio from 4 to more than 7:1.

G. Stipules with very short bristles. Peg thick, hollow.

38. *A. Vallsii*

G'. Stipules with long bristles or without them. Peg slender, compact.

39. *A. subcoriacea*

32. *Arachis lignosa* (Chodat & Hassl.) Krapov. & W.C. Gregory *nov. comb.*
Figs. 2,32; 19,A-B

A. prostrata Benth. var. *genuina* f. *lignosa* Chodat & Hassl., Pl. Hassl. 2: 448, 1904, "*pr. Paraguay, Dec. Hassler n. 6515; in campis pr. Concepción, Sept. Hassler n. 7476.*"

A. marginata Gardn. var. *lignosa* (Chodat & Hassl.) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13 (146-147): 762, 1933. In making this combination, Chevalier only took into account the specimen Hassler 7476.

A. prostrata Benth. var. *lignosa* Chodat & Hassl., Hermann, Agric. Monogr. USDA 19: 10, 1954, *nov. stat. in synom.*

A. lignosa (Chodat & Hassl.) Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 121, 1973, *nomen nudum.*

Perennial plant, taproot without enlargements. In young plants, the collar of the plant is found some 5 cm deep; in mature plants, the bases of the branches are buried some 20 cm, but without forming rhizomes and usually without adventitious roots. Mainstem very short, erect. Lateral branches prostrate, 10-30 cm long, ordinarily with short internodes, 10-15 mm long (up to 25 mm) somewhat angular, lightly pubescent, without bristles. Leaves tetrafoliolate. On the lateral branches the fused part of the stipules measure 4-6 mm long x 4 mm wide, the free tips acute, up to 11 mm long x 1 mm wide at the base. Petiole up to 25 mm long, semi-terete or slightly canaliculate. Rachis 5 mm long. Leaflets obovate or elliptical, obtuse, the apical pair up to 19 mm long x 10 mm wide, the basal pair up to 17 mm long x 9 mm wide. Stipules glabrous or with short, soft hairs on the margin; petiole glabrous; pulvinus glabrous or with some small hairs; leaflets glabrous on both surfaces, margin somewhat marked on the back, also glabrous. Inflorescences axillary, 3-flowered, borne along the length of the lateral branches, the axis covered by the stipules. Flowers appear from between two thin bracts, the lower acute and entire, the upper bifid. Hypanthium 5 (3.5-9) cm long, subglabrous or with silky hairs. Calyx bilabiate, subglabrous or lightly pubescent, occasionally with very few bristles; wide lobe 7 mm long, narrow lobe falcate, 7 mm long. Standard 11 mm long x 12 mm wide, yellow in the center with a broad orange margin, wings 7 mm long, yellow. Fruit biarticulate; peg horizontal, parallel to the surface of the soil, shallow, up to 30 cm long; isthmus ca. 3 cm long; articles some 10-12 mm long x 6-7 mm wide, densely villous, pericarp smooth. 2n=20 chromosomes (Smartt & Gregory 1967, GK 10598).

Lectotype: PARAGUAY. Concepción. Hassler 7476 (G!). Isotypes: BM!, LIL!, NY!, P!, UC!. The

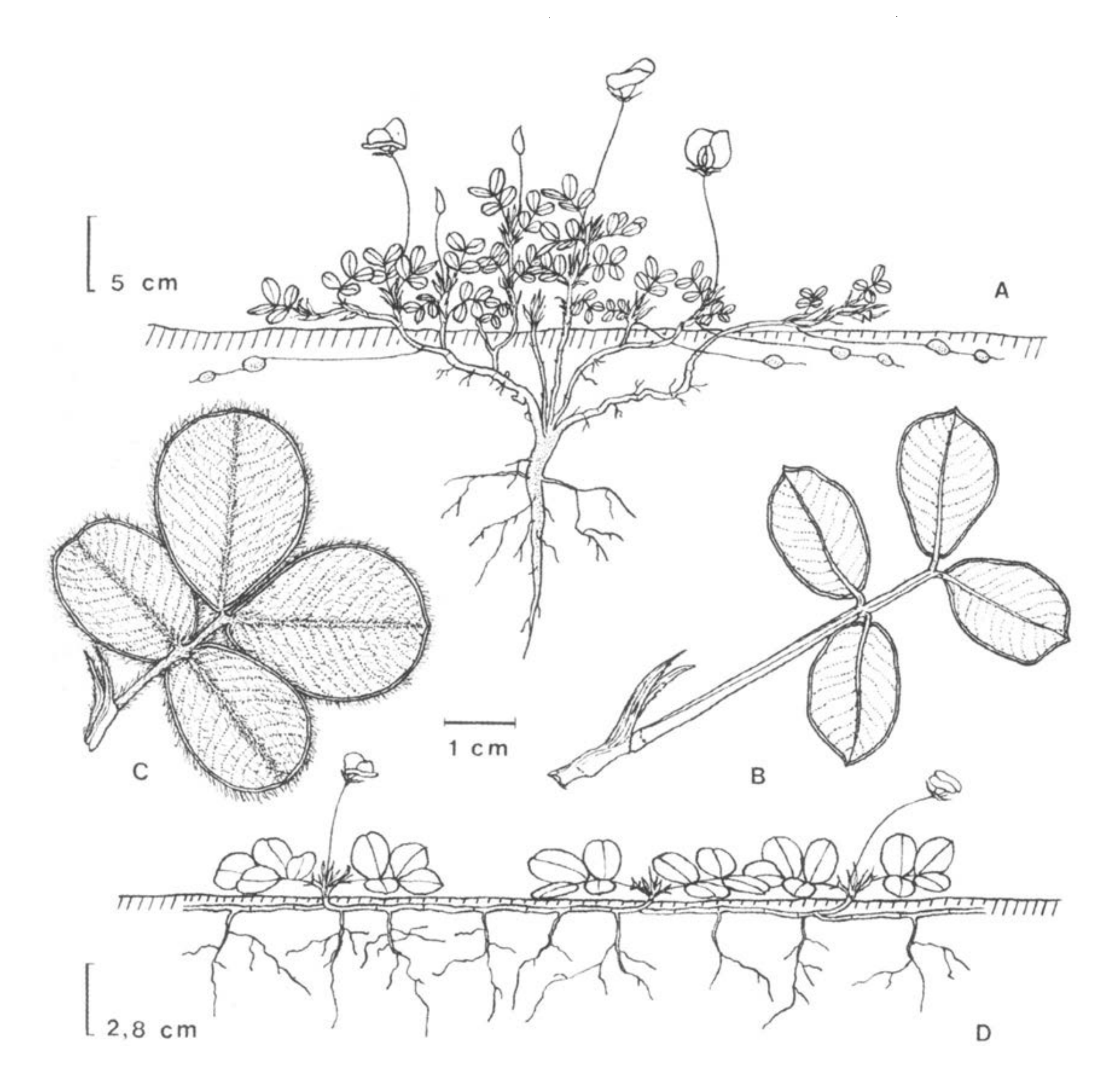


Fig. 19. *Arachis lignosa*: A, schematic of the plant; B, leaf (G.10598). *A. pseudovillosa*: C, leaf; D, schematic of the plant (G.9625).

other specimen mentioned by Chodat & Hassler: Paraguary, Hassler 6513 (see *Numeri corrigendi)* (G!), has rhizomes and corresponds to *A. glabrata* var. *glabrata*.

Selected additional material: PARAGUAY. **Concepción.** Concepción, 22-I-1955, Meyer 18729 (LIL); id., 18-V-1961, Gregory & al. 10598 (CEN, CTES, GH, LIL, MO, NY, US); id., 25-II-1968, Krapovickas & al. 14248 (CTES, US); id., 16-V-1974, Schinini 9188 (CTES); id., 8-XII-1992, Nicora & al. 9785 (CTES, SI); Puerto Fonciere, 18-II-1948, Stephens & al. SH 178 (LIL, NY); id., 18-II-1948, Rojas 14074 (SI); id., 20-I-1949, Ramírez 63 (SI); id., 20-I-1949, Rosengurtt B-5496 (CTES, LIL, MVFA, SI); Estancia Fonciere, 19-I-1949, Ramírez 363 (SI). **Presidente Hayes.** Puerto Militar, puente sobre el río Paraguay, frente a Concepción, 10-XII-1989, Vanni & al. 1291 (CTES).

Geographic distribution. This species grows along the Paraguay River, between Concepción and Puerto Fonciere, in the department of Concepción, in Paraguay. Also, it is found in Puerto Militar, across from Concepción, in the department of P. Hayes.

Obs. The crosses of *A. lignosa* with species of the same section made relatively fertile hybrids, for example, *A. appressipila* (ca. 30%) and *A. Rigonii* (54.4%). On the other hand, the hybrids obtained with *A. major* (0.1%) of section *Erectoides* and *A. Pintoi* (0.2%) of section *Caulorrhizae* were almost totally sterile.

33. *Arachis Kretschmeri* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,33; 20

Herba perennis. Rami prostrati, basem versus radices adventitias emittentes. Caulis angulosus, glaber. Folia praeter aliquot pilos in pulvinulis omnino glabra, foliolis oblongis vel ellipticis, apiculatis, epiphyllo laevi, hypophyllo nervo medio manifestiore, margine parum vel haud distincto, setulis nonnullis instructo. Hypanthium usque ad 10 cm longum, sat villosum. Calyx 5-7 mm longus, fere glaber, setulas tenues paucas gerente. Vexillum usque ad 18 mm longum x 22 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali glabro usque ad 45 cm longo, isthmo 8-15 mm longo, articulis 10-14 mm longis x 6-7 mm latis, apice paulo recurvo, pericarpió laevi.

Holotype: U.S.A. Florida. Fort Pierce. August 21, 1978. (Kretschmer Jr. s/n) submitted by W.C. Gregory 3-30-79 (CTES 34805). The cultivated material came originally from Brasil, Mato Grosso do Sul, 36 km from Miranda on the road to Corumbá, Fazenda Bandeira, 20°7'S, 56°43'W; it was growing in water 4 to 8 inches deep, May 18, 1976, Kretschmer, Jr. & Rayman, cult. IRFL 2273, P.I. 446898 (Kretschmer & Wilson 1988).

Perennial plant. Branches prostrate, 60 cm long or more, with abundant adventitious roots on the basal internodes. Stems cylindrical toward the base and angular toward the ends of the branches; internodes 2-4 cm long, glabrous. On the prostrate branches, a vegetative branch alternates regularly with two reproductive branches. Leaves tetrafoliolate. For the most part the fused portion of the stipules 7-10 mm long, the free portion 10-11 mm long x 2-3 mm wide; petiole 20-30 mm long; rachis 7-10 mm long; apical pair of leaflets 19-21 mm long x 11-15 mm wide, the basal pair 17-18 mm long x 9-11 mm wide. In cultivation the leaves may have larger parts: the free portion of the stipules up to 20 mm long x 5 mm wide at the base, the apical pair of leaflets up to 35 mm x 19 mm and the basal pair up to 30 mm x 15 mm. Leaves totally glabrous except for a few hairs on the pulvinus, occasionally a few adpressed and scarcely visible hairs on the canal toward the apex of the petiole. Margins of the stipules somewhat imbricated at the base of the fused part. Leaflets oblong or elliptical, occasionally somewhat wider on the distal third, apiculate, upper surface smooth, lower surface with somewhat prominent midvein; margin barely marked or unmarked, usually with some widely scattered bristles. Axillary spikes very short, 3-4-flowered, bracts glabrous. Hypanthium up to 10 cm long, more or less villous. Calyx almost glabrous, may show a very few weak bristles; upper lobe 6 mm long, lower lobe 7 mm long, falcate. Standard up to 18 mm long x 22 mm wide, with a yellow center and orange toward the margin, with a few very weak red lines on the upper surface. Fruit biarticulate; peg glabrous, up to 45 cm long, horizontal; isthmus 8-15 mm long; articles 10-14 mm long x 6-7 mm wide, with a slight beak, pericarp smooth with a heavy coat of hairs which strongly retains particles of soil. Seed 11 mm long x 5.5 mm wide. 2n=20 chromosomes (Stalker, data published in Kretschmer & Wilson 1988).

Additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Aquidauana: BR-262, 23 km W do trevo para Aquidauana, 7-IV-1986, Valls & al. 9907 (CEN, CTES); BR-262, 20,5 km W do acesso a Aquidauana, 19-IV-1984, Valls & al. 7631 (CEN, CTES); id., 5-IV-1986, Valls & al. 9889 (CEN, CTES); id., 30-X-1986, Valls & al. 10404 (CEN, CTES); 35 km W de Aquidauana, 19-IV-1984, Valls & al. 7633 (CEN); 8 km S da BR-262 na estrada Aquidauana-Nioaque, 7-IV-1986, Valls & al. 9917 (CEN, CTES). Mun. Corumbá: dist. Nabileque, Faz. São Bento, Campo brejoso junto a mata de Carandá, 17-XI-1977, Allem & al. 1318 (CEN, US); 40 km de Corumbá, camino a Porto Manga, 7-XII-1976, Krapovickas & al. 30007 (CEN, CTES, GH, MO, NY, RB, SI, SP, US); 5 km E de Monjolo na estrada de Corumbá a Porto Manga, 12-X-1985, Valls & al. 9129



Fig. 20. *Arachis Kretschmeri*: plant (IRFL 2273).

(CEN, CTES). Mun. Miranda: Fazenda Bodoquena, Secçao Guaicurus, 25-X-1978, Allem & al. 2147 (CEN, CTES); 10 km S da BR-262 no acesso á sede Guaicurus da Faz. Bodoquena, 19-IV-1984, Valls & al. 7637 (CEN, CTES); id., 6-IV-1986, Valls & al. 9904 (CEN, CTES).

Cultivated material: ARGENTINA. **Córdoba.** Manfredi, Estación Experimental INTA, cult. No. 64, de semillas del holotipo, 14-III-1985, Krapovickas & al. 40053 (CEN, CTES, LIL, MO, NY, SI, SP, US).

Geographic distribution. This species grows on the southern edge of the Gran Pantanal, from the area around Corumbá to the vicinity of Aquidauana, in the state of Mato Grosso do Sul, in Brazil. It grows very well on land that is subject to periodic flooding.

Obs. The collector of the type specimen is conducting adaptation trials in Florida (USA) where the species, that he calls the "pantanal peanut," shows good promise as a forage plant (Kretschmer & Wilson 1988).

34. *Arachis Rigonii* Krapov. & W.C. Gregory
Fig. 2,34

Krapovickas & Gregory, Rev. Invest. Agríc. 14(2): 157-160, fig. 1, 1960.

Perennial plant. Taproot with branch roots without enlargements. Mainstem erect, short; lateral branches procumbent, ca. 50 cm long, stems subquadrangular, young parts villous along the angles, the rest with scattered adpressed hairs. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules 8 mm long, the free tips up to 16 mm long; petiole up to 45 mm long; leaflets oval-oblong, the apical pair ca. 25 mm long x 14 mm wide (up to 30 mm x 17 mm), the basal pair ca. 22 mm long x 13 mm wide (up to 27 mm x 14 mm). On the lateral branches, the fused portion of the stipules 8 mm long x 5 mm wide, the free tips up to 11 mm long; petiole up to 30 mm long; the apical pair of leaflets 16 mm long x 11 mm wide (up to 26 mm x 17 mm), basal pair 14 mm long x 9 mm wide (up to 23 mm x 14 mm). Stipules with very small, adpressed hairs widely scattered on the lateral surfaces, and a line of somewhat longer hairs along the back of the fused portion; margin weakly villous. Petiole canaliculate, the back weakly villous to subglabrous; pulvinus villous. Upper surface of the leaflets glabrous, the lower surface subglabrous with scattered, diminutive adpressed hairs, margin and veins very slightly marked, margin weakly villous. Spikes axillary, 2-3-flowered, axis very short, covered by the base of the stipules. Hypanthium 6.6 cm (4-13 cm) long, villous. Calyx bilabiate, 6 mm long, pubescent, sometimes with an occasional bristle. Standard entirely yellow, ca. 10 mm long; wings 5-7 mm long, yellow. Fruit biarticulate; peg horizontal up to 65 cm long; isthmus sinuous, 2-17 cm long; articles 10-13 mm long x 5-7 mm wide, the apical one slightly larger, somewhat flattened at the apex and terminating in a beak; pericarp lightly reticulate, almost smooth. 2n=20 chromosomes (Krapovickas & Gregory 1960).

Holotype: BOLIVIA. Santa Cruz de la Sierra. 20-II-1958, Krapovickas 9459 (LIL). Isotypes: BAB, CTES, SI.

Additional material: BOLIVIA. **Santa Cruz.** Santa Cruz de la Sierra, 4-IV-1959, Gregory & al. 10034 (BAB, CTES, GH, LIL, MO, NY, SI, US).

Geographic distribution. This species is known only from the type locality, where it was collected on a street some 400 m from the central square of the city of Santa Cruz de la Sierra, when its sandy streets had not yet been paved.

Obs. This species occupies an important position in the genus because of its great capacity for interspecific hybridization. The hybrids obtained with species of its same section have a high degree of fertility, as is the case with *A. appressipila* (40.2%) and *A. lignosa* (54.4%). In hybrids obtained with species of other sections, the fertility declines noticeably. Hybrids were obtained with the following species of section *Erectoides*: *A. gracilis* (12.2%), *A. Hermannii* (7%), *A.*

paraguariensis ssp. *paraguariensis* (1 to 5%), *A. Benthamii* (2.6%), *A. major* (0.3 to 1%), *A. Archeri* (0.8%), *A. Martii* (0.3%) and *A. Oteroi*. It was also crossed with *A. Pintoi* (0.2%) of section *Caulorrhizae* and with *A. glabrata* var. *glabrata* and *A. pseudovillosa*, tetraploid species of section *Rhizomatosae*.

35. *Arachis chiquitana* Krapov., W.C. Gregory & C. E. Simpson *nov. sp.*

Figs. 2,35; 23,A

Herba perennis. Caulis principalis erectus ramis procumbentibus radices adventitias in internodiis basalibus gerentibus. Stipulae dorso et basi pilis longis, raro etiam setulis munitae, praeter illos usque glabrae. Foliola foliorum caulis principalis elliptica, acuta, apiculata, illa foliorum ramealium ovalia usque obovata, apiculata usque obtusa, epiphyllo laevi, glabro, hypophyllo nervo medio prominente et nervis secundariis sat perspicuis, pilis adpressis vix conspicuis vestito glabrove, margine manifestiore ciliis caducis setulisque brevibus nonnullis instructo. Hypanthium 4-7.5 cm longum, villosum. Calyx 5-8 mm longus, setulis sparsis immixtis villosus. Vexillum aurantiacum, ca. 12 mm longum. Fructus biarticulatus paxillo horizontali paulo profundo 8-12 cm longo, isthmo ca. 2 cm longo, articulis ca. 10 mm longis x 5 mm latis, apice recurvo, pericarpio laevi.

Holotype: BOLIVIA. Santa Cruz. Prov. Chiquitos, 30 km NE de San José de Chiquitos, 60°47'W, 17°47'S, 300 m., puesto San Marcos, en lugar bajo, inundado, arenoso; perenne, ramas postradas, corola anaranjada, 27-IV-1980, Krapovickas, Simpson & Schinini 36027 (CTES). Isotypes: CEN, G, GH, K, LIL, LPB, MO, NY, P, SI, SP, US.

Perennial plant. Taproot deep, 10-14 mm in diameter, with thin branches. Mainstem erect, 10-20 cm long, the internodes of its upper half covered by the stipules. Lateral branches prostrate, up to 70 cm long, internodes 20-40 mm long, villous toward the end of the branches. Adventitious roots on the basal internodes of the mainstem and along the length of the lateral branches, especially when they grow submerged or in contact with water. Leaves tetrafoliolate, dimorphous, those of the mainstem notably larger than those of the lateral branches. On the mainstem, the fused portion of the stipules up to 8-10 mm long, the free portion up to 24 mm long x 3 mm wide, acute. Petiole up to 35 mm long; rachis 11 mm long; leaflets elliptical, acute, apiculate, the apical pair up to 37 mm long x 13 mm wide, the basal pair 34 x 12 mm. On the lateral branches, in well-developed leaves, the fused portion of the stipules 5-7 mm long, the free portion 13-18 mm long x 2.5-3 mm wide; petiole 10-17 mm long; rachis 5-6 mm long; leaflets from elliptical to obovate, apiculate to obtuse, apical pair 20-24 mm long x 11-18 mm wide, the basal pair 16-21 mm long x 9-13 mm wide. Stipules with glabrous surfaces, margins longly ciliate, hairs caducous, frequently with long hairs on the back of the fused part, occasionally villous at the base, rarely with very short hairs scattered on the surface of the fused part, very rarely with bristles. Petiole and rachis canaliculate, back laxly villous, margin of both canals ciliate, small adpressed hairs barely visible in the canal. Pulvinus villous. Upper surface of the leaflets smooth and glabrous; lower surface with prominent midvein, margin and secondary veins somewhat marked, with barely visible scattered adpressed hairs or glabrous, occasionally long hairs on the midvein; margin longly ciliate, cilia caducous, sometimes with a few short, persistent bristles. Flowers on the central axis and along the lateral branches, in very short, few-flowered spikes. Hypanthium 4-7.5 cm long, villous. Calyx bilabiate, villous and with scattered bristles, lower lobe falcate, 6-8 mm long, upper lobe wide, 5-6 mm long. Standard orange, ca. 12 mm long (when dry). Fruit subterranean, biarticulate; peg horizontal, shallow, glabrous, 8-12 cm long, isthmus ca. 2 cm long; articles smooth, beaked, 10 mm long x 5 mm wide; seed 7 mm long x 4 mm wide.

Additional material: BOLIVIA. **Santa Cruz.** Prov. Chiquitos: 5 km N de San José, estancia El Cinco, 26-IV-1980, Krapovickas & al. 36025 (CEN, CTES, GH, LIL, LPB, MO, NY, RB, US); 4 km N de San José, camino a San Ignacio, 28-IV-1980, Krapovickas & al. 36028 (CTES, LPB, MO, NY, US); San José, cult. en la estación de gasolina, 29-IV-

1980, Krapovickas & al. 36031 (CEN, CTES, LIL, LPB, MO, NY, US).

Geographic distribution. This species was collected in the neighborhood of San José de Chiquitos, in the "Chiquitano" massif, on the northern edge of the "chaco" region. It occurs in low places subject to flooding.

Obs. Ordinarily, the stipules of this species have no bristles, but in populations 36027 and 36031 a few plants were found with bristles on leaves located toward the end of some branches.

36. *Arachis matiensis* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*
Fig. 2,36

Herba perennis. Rami procumbentes. Caulis angulosus, viridis, glaber. Stipulae glabrae, violaceae. Folia caulis principalis foliolis ellipticis, acutis, ramealia foliolis ellipticis usque obovatis, omnia epiphyllo laevi, glabro, hypophyllo glabro nervo medio et margine manifestioribus, margine pilis sericeis caducis setulisque nonnullis persistentibus instructo. Hypanthium 2.5-6 cm longum, villosum. Calyx 5-8 mm longus setulis tenuibus sparsim immixtis villosus. Vexillum 11-14 mm longum x 16 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali usque ad 60 cm longo, isthmo 3-9 cm longo, articulis 10-15 mm longis x 6-7 mm latis, apice recurvo, pericarpio laevi.

Holotype: BOLIVIA. Dep. Santa Cruz. Prov. Sandoval, 1 km N de San Matías, 56°26'W, 16°21'S, 170 m, Krapovickas, Simpson & Schinini 36014 (CTES). Isotypes: G, GH, LPB, MO, NY, SI, SP, US.

Perennial plant. Taproot deep, 10-15 mm in diameter. Mainstem erect, ca. 25 cm long, lateral branches prostrate, up to 80 cm long. In plants of several years, the mainstem may become remarkably bulky at ground level owing to numerous short, crowded branches. Similar branchlets, with dense cataphylls, frequently occur along the branches. Stem green, angular, glabrous, rarely pilose; internodes very short toward the apex of the branches but up to 65 mm long in full-grown branches. Leaves tetrafoliolate. On the mainstem, leaves somewhat larger than those on the lateral branches; stipules with the fused portion purplish, up to 19 mm long, the free ends up to 25 mm long x 2 mm wide; petiole up to 53 mm long; rachis 18 mm long; leaflets elliptical, somewhat asymmetrical at the base, apex acute, the apical pair up to 46 mm long x 20 mm wide, the basal pair 42 x 18 mm. On the lateral branches, the fused portion of the stipules usually 8 mm long, the free ends acute, 15 mm long x 2 mm wide (up to 19 mm x 2 mm); petiole 18 mm long; rachis 6 mm long; leaflets elliptical, acute, apical pair 26 mm long x 10 mm wide (up to 43 mm x 13 mm), the basal pair 24 mm long x 9 mm wide (up to 38 mm x 11 mm), frequently the leaflets toward the base of the stems are relatively wider, from obovate to obtuse, with acute apex. Stipules with margins somewhat imbricated at the base, usually glabrous, occasionally somewhat villous on the back of the fused portion. Petiole and rachis glabrous, rarely somewhat villous with short hairs. Upper surface of the leaflets smooth, glabrous (very rarely with short scattered hairs); lower surface glabrous, veins and margin somewhat marked (sometimes with barely visible adpressed hairs); margin with caducous silky hairs and some short, persistent bristles. Flowers along the lateral branches in very short, few-flowered axillary spikes. Hypanthium 2.5-6 cm long, villous; calyx bilabiate, villous and with scattered thin bristles, lower lobe falcate, 6-8 mm long, upper lobe 5-6 mm long; standard 11-14 mm long and up to 16 mm wide, orange, wings up to 8 mm long, yellow or yellow bordered with orange. Fruit biarticulate; peg horizontal up to 60 cm long, glabrous or subglabrous, rarely pubescent; isthmus 3-9 cm long; articles 10-15 mm long x 6-7 mm wide, smooth, beaked, covered by a dense coat of diminutive hairs. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BOLIVIA. **Santa Cruz.** Prov. Sandoval: Sandoval, San Matías, 1 km W del aeropuerto, 17-IV-1980, Krapovickas & al. 36007 (CEN, CTES, G, GH, LIL, LPB, MO, NY, US); id., aeropuerto, 17-IV-1980, Krapovickas & al. 36008

(CEN, CTES, G, GH, K, LIL, LPB, MO, NY, SI, US); id., 5 km SW del aeropuerto, 18-IV-1980, Krapovickas & al. 36296 (CTES); 2 km NW de San Matías, 20-IV-1980, Krapovickas & al. 36303 (CTES, LPB, US); 1 km N de San Matías, camino a San Francisco, 24-VIII-1981, Valls & al. 6345 (CEN, CTES); 3,5 km NNW de San Matías, 20-IV-1980, Krapovickas & al. 36010 (CTES); id., Krapovickas & al. 36012 (CTES). Prov. Ñuflo de Chavez: Estancia Novicia, 30 km de Concepción, 62°12'W, 16°29'S, 500 m, 2-V-1977, Krapovickas & al. 30094 (CEN, CTES, G, GH, K, LPB, MO, NY, SI, SP, US); id., Krapovickas & al. 30095 (CTES); 24 km W de Concepción, camino a San Javier, 3-V-1977, Krapovickas & al. 30096 (CTES).

BRAZIL. **Mato Grosso.** Porto Esperidião 58°28'W, 15°52'S, 155 m, 26-VIII-1981, Valls & al. 6357 (CEN, CTES, GH, MO, NY, US); 49 km WNW of Cáceres, on road to Pto. Esperidião, 220 m, 25-VIII-1981, Valls & al. 6356 (CEN, CTES, US); 14 km NW of Porto Esperidião, 220 m, 26-VIII-1981, Valls & al. 6361 (CEN, CTES, US); 66 km NW of Porto Esperidião, on road to Pontes e Lacerda, 200 m, 26-VIII-1981, Valls & al. 6366 (CEN, CTES, GH, MO, NY, US); 56 km NW of Porto Esperidião, on road to Pontes e Lacerda, Estancia Dois Irmaos, 160 m, 30-VIII-1981, Valls & al. 6405 (CEN, CTES, US); 33 km of Porto Esperidião, Fazenda Paraiso do Norte on road to Pontes e Lacerda, 170 m, 30-VIII-1981, Valls & al. 6407 (CEN, CTES, NY, US); 9 km ENE of Porto Esperidião on road to Cáceres, 150 m, 30-VIII-1981, Valls & al. 6408a (CEN, CTES, GH, MO, NY, US); Cáceres, cult. at the airport, 31-VIII-1981, Valls & al. 6409 (CEN, CTES); Cuiabá, in flower beds at the Federal University of Mato Grosso, cult., 20-VIII-1981, Valls & al. 6324 (CEN, CTES); 9 km ENE de Porto Esperidião, 18-V-1985, Valls & al. 8756 (CEN, CTES); 56 km NW de Porto Esperidião, 28-V-1985, Valls & al. 8890 (CEN, CTES); 12 km da BR-174, camino de Porto Esperidião a Casalvasco, 28-V-1985, Valls & al. 8893 (CEN, CTES); Varzea Grande, 4-XI-1986, Valls & al. 10468 (CEN, CTES); id., Valls & al. 10469 (CEN, CTES).

Related material (with bristles on the stipules): **Mato Grosso.** Mun. Cáceres: 37 km E de Cáceres camino a Cuiabá, 17-XII-1976, Krapovickas & al. 30033 (CTES); 47 km de Cáceres, camino a Cuiabá, 17-XII-1976, Krapovickas & al. 30040 (CTES). Mun. Poconé: 30 km W de Poconé, camino a Cáceres, 16-XII-1976, Krapovickas & al. 30030 (CTES); 33,8 km ao longo da estrada para Cáceres que parte da rodovia Poconé-Cuiabá, 10 km alem de Poconé, 24-X-1985, Valls & al. 9350 (CEN, CTES); BR-070 km 623, 1,8 km W do corr. dos Macacos, 17-V-1985, Valls & al. 8736 (CEN, CTES); 126 km WSW of Cuiabá, on road to Cáceres, 22 km W of Sete Porcos, 22-VIII-1981, Valls & al. 6337 (CEN, CTES). Mun. Santo Antonio de Leverger: Sto. Antonio de Leverger, 24-I-1989, Valls & al. 12084 (CEN, CTES).

Geographic distribution. Occurs in the eastern part of the Dep. of Santa Cruz (Bolivia) and in the western border areas of Mato Grosso (Brazil), where it was collected along the 16th parallel South, between 57°37'W and 62°14'W. It prefers the "cerrado," called "pampa" in eastern Bolivia.

Obs. 1. The specimen Krapovickas 30096 is distinguished by being somewhat more villous and by the small hairs on the upper surface of the leaflets, the same as Valls & al. 6408a. The first was collected at the western extreme and the second at the eastern extreme of the range of this species.

Obs. 2. In the eastern part of the range of *A. matiensis*, at 26 km east of Cáceres (MT), on highway BR-174, km 705 (Valls & al. 6340 and 8910), is found a population of an *Arachis* that grows in calcareous soil and is distinguished from *A. matiensis* by its more vigorous habit and by its larger fruit. This could be another taxon, but it would be advisable to examine additional material to make a decision in that regard.

37. *Arachis appressipila* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,37; 21

Herba perennis. Caulis principalis erectus ramis decumbentibus. Caulis angulosus apicem versus pilis paucis adpressis vestitus, cetero glabrescens. Stipulae glabrae vel pilos paucos parvissimos adpressos basi gerentes, margine laxe ciliatae. Foliola ovali-lanceolata epiphyllo laevi, glabro, hypophyllo nervo medio et margine prominentibus, nervis secundariis inconspicuis, in nervis pilis brevibus adpressis vestito, in nervo medio



Fig. 21. *Arachis appressipila*: plant (G.10000).

majoribus. Hypanthium 4-9 cm longum, laxe villosum. Calyx 6-8 mm longus, plus minusve setulis nonnullis tenuibus immixtis villosus. Vexillum 14-17 mm longum x 16-18 mm latum, aurantiacum. Fructus biarticulatus paxillo horizontali usque ad 30 cm longo, paulo profundo, articulis 13 mm longis x 7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Corumbá, aeropuerto, 27-III-1959, Gregory, Krapovickas & Pietrarelli 9990 (SP). Isotypes: CTES, G, GH, LIL, MO, NY, SI, US.

Perennial plant. Taproot, with slender branches, without enlargements. Flowers and fruits clustered about the crown. Mainstem erect, up to 50 cm long; lateral branches decumbent, ca. 50 cm long, internodes toward the base of the branches up to 7 cm long, cylindrical, glabrous; the internodes toward the apex 1-2 cm long, angular, lightly pubescent, hairs adpressed. Leaves tetrafoliolate. The fused part of the stipules some 12 mm long x 6 mm wide with the margins imbricated at the base, the free tips acute, some 17 mm long x 2 mm wide. Petiole canaliculate, in well-developed leaves 1.5-3 cm long. Rachis 0.5-1 cm long, canaliculate. Leaflets oval-lanceolate, apical pair up to 50 mm long x 16 mm wide, basal pair up to 40 mm long x 13 mm wide. Basal portion of the stipules glabrescent or with very small, scattered, adpressed hairs; the free portion with glabrous surfaces and the margin weakly ciliate. Petiole glabrescent or with scattered adpressed hairs. Pulvinus with a few short hairs. Leaflets with upper surface smooth, glabrous, the lower surface with prominent midvein and margin, secondary veins somewhat marked, and the surface with scattered, small, adpressed hairs, and adpressed hairs a little longer on the midvein; the margin weakly ciliate and occasionally with some bristles. Inflorescences clustered at the collar of the plant and also along the length of the branches; the axillary spikes ca. 5 mm long, covered by the stipules, 5-6-flowered; bifid bracts ca. 15 mm long. Hypanthium 7 (4-9) cm long, weakly villous. Calyx more or less villous, with some thin bristles, bilabiate, the wider lobe 6 mm long, the narrower lobe falcate, 7-8 mm long. Standard 14-17 mm long x 16-18 mm wide, orange toward the margin and yellow at the base, pinkish veins on the upper surface; wings 7-10 mm long, yellow. Fruit biarticulate; peg up to 30 cm long, horizontal; isthmus 1-9.5 cm long; articles ca. 13 mm long x 7 mm wide, the apical articles always somewhat larger, up to 15 mm long x 7 mm wide; pericarp smooth. Seed with ocherous seed coat, 10-11 mm long x 5-6 mm wide. 2n=20 chromosomes (Gregory & al. 9993).

Selected additional material: BRAZIL. **Mato Grosso do Sul.** Corumbá, XII-1902, Robert 731 & 761 (BM); II-1911, Hoehne, Comissão Rondon 2624 (R); Corumbá, 3-XII-1943, Baldwin 3141 (NY, SP, US); 28-III-1959, Gregory & al. 9993 (GH, LIL, MO, NY, SI, US); 5-XII-1976, Krapovickas & al. 30002 (CEN, CTES, GH, MO, NY, US); id., Krapovickas & al. 30003 (CTES, NY, US); 3 km de Corumbá camino a Urucum, 29-III-1959, Gregory & al. 10002 (GH, LIL, MO, NY, US); 4 km de Corumbá, camino a Urucum, 29-III-1959, Gregory & al. 10000 (GH, LIL, MO, NY, SI, US); 12 km de Corumbá camino a Urucum, 5-XII-1976, Krapovickas & al. 30004 (CEN, CTES, GH, MO, NY, US); 15 km E de Corumbá, 9-XII-1976, Krapovickas & al. 30010 (CTES); Faz. Nova Campina, 9-XII-1976, Krapovickas & al. 30009 (CEN, CTES, G, GH, MO, NY, US); Estr. do Gaturamo, 15-IV-1972, Hatschbach 29502 (CTES, MBM); 5 km S de Corumbá, 22-XI-1977, Allem & al. 1452 (US); id., Allem & al. 1455 (US); Corumbá, 9-X-1985, Valls & al. 9056 (CEN, CTES); id., 10-X-1985, Valls & al. 9060 (CEN, CTES); Faz. Coqueiro, 17 km desde a BR-262 pela estrada para Forte Coimbra, 10-X-1985, Valls & al. 9077 (CEN, CTES); id., 25-X-1986, Valls & al. 10322, 10323, 10324 (CEN, CTES).

Common name. "amendoim bravo" (Allem & al. 1452).

Geographic distribution. This species is restricted to a small area in the vicinity of Corumbá, on the eastern bank of the Paraguay River.

Obs. Even though *A. appressipila* is a decumbent species, the crossing results demonstrate that its greatest affinity is with the species that have spreading branches which make up the rest of section *Procumbentes*. The hybrids obtained with *A. lignosa* (30.9%)

and with *A. Rigonii* (40.2%) have partial fertility. In contrast, the hybrids with species of other sections are highly sterile, as is the case with *A. major* (4.8%), *A. paraguariensis* ssp. *paraguariensis* (1 to 4.5%), *A. Hermannii* (1.9%), *A. Martii* (0.4%) and *A. Benthamii* of section *Erectoides*, *A. guaranitica* (0.7%) of section *Trierectoides*, and *A. glabrata* var. *glabrata*, a tetraploid species of section *Rhizomatosae*.

38. *Arachis Vallsii* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,38; 22

Herba perennis. Radix palaris. Caulis principalis reclinatus usque ad 1.60 m longus, pauciramosus, rami procumbentes. Folia glabra stipulis brevissime setulosis, foliolis lanceolatis epiphyllo laevi, hypophyllo nervo medio prominente, margine paucis pilis brevissimis et setulis nonnullis brevibus munitis. Hypanthium 5 cm longum parce pilosum. Calyx 5-6 mm longus. Vexillum aurantiacum. Fructus subterraneus, biarticulatus, paxillo longo, crasso, cavo, glabro, articulis 12-15 mm longis x 6-7 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. 37.8 km a oeste da saida de Miranda na BR-262 em area inundavel ao longo da rodovia, campo graminoso con "carandá" (*Copernicia*) proximo de mata, 19-IV-1984, Valls, Rao, Gerin & Silva 7635 (CEN). Isotype: CTES.

Perennial plant. Taproot, without enlargements. Mainstem scandent, up to 1.60 m long, with little branching. Stems with abundant adventitious roots, toward the thick base, to 4 mm in diameter, hollow, with a vestiture consisting of abundant very short bristles. Leaves tetrafoliolate. Stipules with the fused portion to 13 mm long, the free portion 15 mm long x 2 mm wide, very short bristles uniformly distributed, margin with a few short caducous hairs. Petiole up to 38 mm long and rachis up to 10 mm long, both nearly glabrous, with very few hairs and a few short bristles. Pulvinus somewhat pilose. Leaflets lanceolate, but toward the base of the branches some may be oblong or oblong-lanceolate, apical leaflets to 59 mm long x 8 mm wide, basal leaflets to 50 mm long x 7 mm wide, both surfaces glabrous, upper side smooth, under side with only the midvein marked, margin with scarce, very small caducous hairs and some short bristles. Hypanthium 5 cm long, with few hairs. Calyx 5-6 mm long, with few short hairs and some very short bristles. Standard ca. 11 mm long, orange. Fruit subterranean, biarticulate; peg thick, hollow, glabrous; articles 12-15 mm long x 6-7 mm wide, beak somewhat pronounced. Seeds 10-11 mm long x 4.5-6 mm wide.

Additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Corumbá: 35 km SE de Corumbá, camino a Porto Manga, Fazenda Vale do Paraiso y luego 6 km de la ruta, hacia el N, hacia Baía Negra y Banda Alta, 57°30'W, 19°05'S, 10-XII-1976, Krapovickas & Gregory 30012 (CTES); 38,8 km a partir da entrada para Miranda ao longo da BR-262 em direçao a Corumbá, 23-IV-1985, Valls & al. 8678 (CEN, CTES); id., 31-X-1985, Valls & al. 9481 (CEN, CTES); id., Valls & al. 9482 (CEN, CTES); id., 6-IV-1986, Valls & al. 9902 (CEN, CTES); id., 28-X-1986, Valls & al. 10357 (CEN, CTES).

Geographic distribution. This species grows to the south of the Gran Pantanal, in Mato Grosso do Sul. It is known only from the collections made at the type locality and a very small herbarium specimen (Krapovickas & al. 30012) collected next to the type specimen of *A. valida*, in very similar environments, that is, in periodically flooded grasslands with *Copernicia* palms.

We dedicate this species to José Francisco Montenegro Valls, researcher at the Centro Nacional de Recursos Genéticos (EMBRAPA), Brasilia, who collected most of the material of this species.

39. *Arachis subcoriacea* Krapov. & W.C. Gregory *nov. sp.*

Figs. 2,39; 23,B

Herba perennis. Rami procumbentes. Caulis angulosus, glaber. Stipulae glabrae interdum setulosae. Folia glabra. Foliola lanceolata,

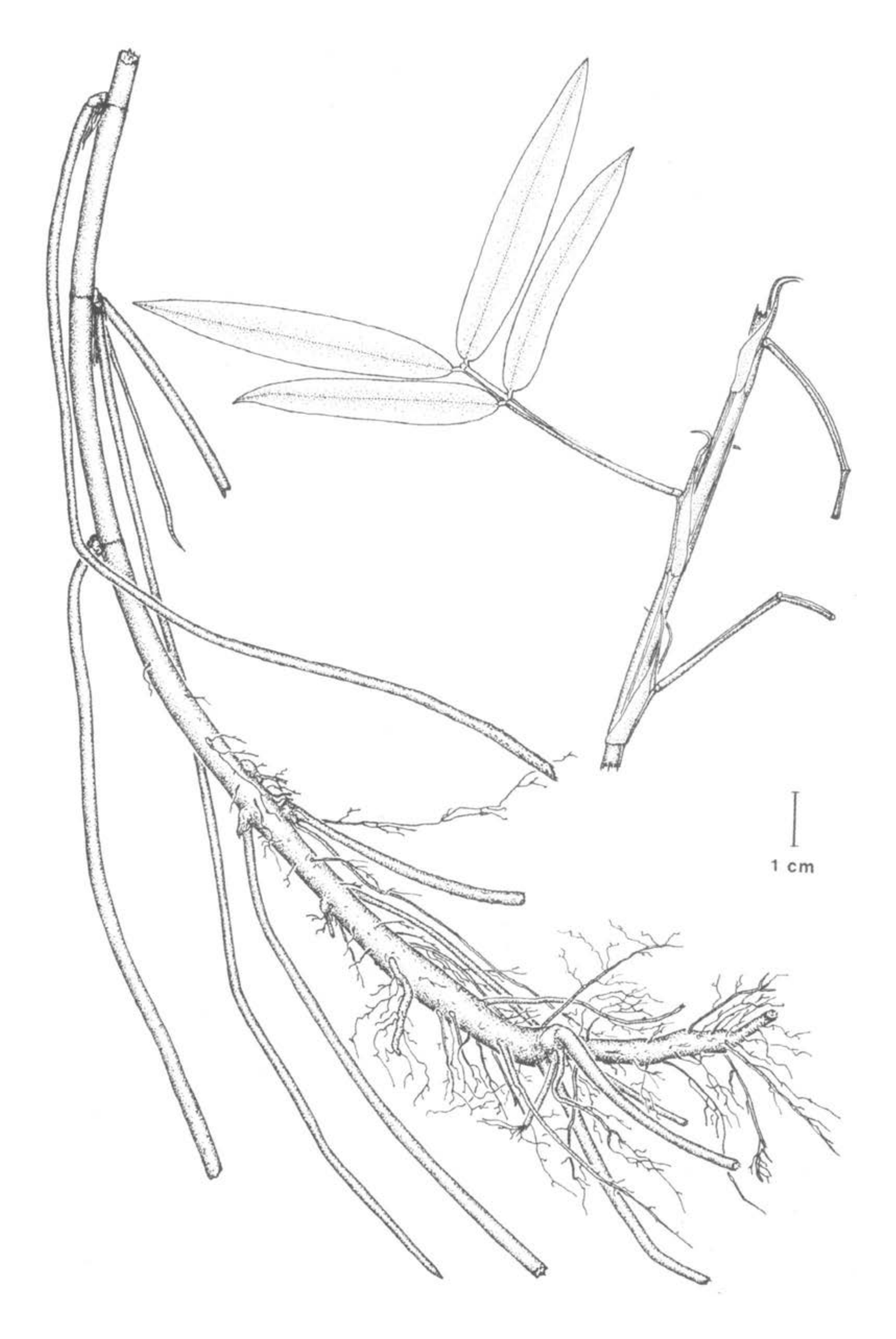


Fig. 22. *Arachis Vallsii*: A, base of the plant with pegs (V.9902); B, leaf (V.7635).



Fig. 23. *Arachis chiquitana*: A, branch (K.36027). *A. subcoriacea*: B, branch (K.30037). *A. triseminata*: C, leaf (G.12881).

acuta, apiculata, rigida, subcoriacea, epiphyllo laevi, hypophyllo nervo medio et margine prominentibus, nervis secundariis manifestioribus, margine setulis nonnullis brevibus instructo. Hypanthium 5-9 cm longum, parce plus minusve adpresso-piloso. Calyx 6-10 mm longus, praeter pilos paucos in apicibus dentium et setulas paucas sparsas glaber. Vexillum suborbiculare, 10-15 mm longum, aurantiacum. Fructus biarticulatus paxillo horizontali ca. 25 cm longo, articulis 14-17 mm longis x 6-7 mm latis, apice recurvo, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso. Mun. Cáceres, 106 km E de Cáceres, camino a Cuiabá, 57°8'W, 15°56'S, 17-XII-1976, Krapovickas &

Gregory 30037 (CEN). Isotypes: CTES, G, GH, K, LIL, MO, NY, P, RB, SI, SP, US.

Perennial plant. Taproot 8-10 mm in diameter, deep, strong, without enlarged branch roots. Branches procumbent, short, 20-30 cm long, with little subsequent branching at the basal nodes. Stem angular, glabrous, internodes 10-30 cm long. Leaves tetrafoliolate. Stipules with the fused portion 7-10 mm long, the free part triangular, acute, 13-15 mm long x 1-2 mm wide. Petiole 13-24 mm long; rachis 5-6 mm long. Apical pair of leaflets 24-30 mm long x 4-7 mm wide, basal pair 21-25 mm long x 3-5.5 mm wide. Stipules glabrous or with bristles, with parallel veins somewhat marked; toward the base, at the union with the stem, the margins are somewhat superimposed. Petiole and rachis canaliculate, glabrous; pulvinus with a few short hairs on the upper side. Leaflets lanceolate, acute, apiculate, rigid, subcoriaceous; upper surface smooth, glabrous; lower surface glabrous, midvein and margin prominent, secondary nerves somewhat marked; margin with some short bristles. In cultivated material the margins of the stipules and the leaflets are softly ciliate and with a few bristles at the base of the stipules. Flowers along the length of the branches in short, 4-flowered spikes. Hypanthium 5-11 cm long, somewhat villous, with few hairs, more or less adpressed. Calyx glabrous except for some small hairs at the tip of the teeth and some short, scattered bristles; upper lobe 6-7 mm long, tridentate, lower lobe 8-10 mm long, falcate. Standard suborbicular, 10-15 mm long, orange; wings yellow, 10-11 mm long. Fruit subterranean, biarticulate; pegs thin, horizontal, up to 72 cm long, glabrous above ground, below ground with hairs that retain a little soil; isthmus up to 20 cm long; articles 14-17 mm long x 6-7 mm wide, smooth, with a well-developed beak.

Selected additional material: BRAZIL. **Mato Grosso.** Mun. Cuiabá: sandy marsh and adjacent cerrado, on BR-364 near Córrego Pindaival, 350 m, 11-II-1975, Anderson 11338 (MBM); Rodovia MT-364, 35 km leste de Cuiabá, 13-XI-1975, Hatschbach 37496 (CTES, MBM). Mun Cáceres: 106 km E de Cáceres, 17-XII-1976, Allem 750 (CEN); BR-070, km 696,6 (30 km E de Cáceres), 30-V-1985, Valls & al. 8943 (CEN, CTES); id., Valls & al. 8941 (CEN, CTES); BR-070, km 685 (42 km E de Cáceres), 30-V-1985, Valls & al. 8937 (CEN, CTES); id., Valls & al. 8935b (CEN, CTES); BR-070, km 652 (75 km E de Cáceres), 17-V-1985, Valls & al. 8750 (CEN, CTES); id., 29-V-1985, Valls & al. 8920 (CEN, CTES); id., 30-V-1985, Valls & al. 8922 (CEN, CTES); BR-174 km 680, Oasis, 29-V-1985, Valls & al. 8916b (CEN, CTES); 5,2 km NE do Ribeirao Flexas, rodovia BR-364, entre Cáceres e Cuiabá, 24-X-1985, Valls & al. 9357 (CEN, CTES); id., 9358 (CEN, CTES); id., 9359 (CEN, CTES); 2-XI-1986, Valls & al. 10445 (CEN, CTES); id., Valls & al. 10447 (CEN, CTES). Mun. S. Antonio do Leverger: 4,6 km de Santo Antonio na estrada para Barao de Melgaço, 27-X-1985, Valls & al. 9401 (CEN, CTES); id., 9402 (CEN, CTES); id., 9403 (CEN, CTES); id., 24-I-1989, Valls & al. 12080 (CEN, CTES).

Geographic distribution. This species grows to the north of the Pantanal Matogrossense, in Mato Grosso, in places subject to flooding, between Cáceres and the vicinity of Cuiabá.

Obs. *Arachis subcoriacea* has a certain similarity to *A. Diogoi* for the size of the plant and for its lanceolate leaflets. They differ in the texture of their leaves, more smooth in *A. Diogoi*, and in the development of the peg, which in *A. subcoriacea* is horizontal and shallow, and deep and inclined some 45° in *A. Diogoi*.

Included in this species are various specimens with broader leaflets, possibly from growing in shaded places.

VIII. *Sect. Rhizomatosae* Krapov. & W.C. Gregory *nov. sect.*

Fig. 8

Sect. Rhizomatosae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 92, 1973, *nomen nudum*. Krapovickas, Agricultural Genetics. Selected Topics: 137, 1973.

Perennes. Radix palaris, rhizomata adsunt. Rami procumbentes. Folia quadrifoliolata. Vexillum aurantiacum, raro luteum. Fructus biarticulatus paxillo plus minusve verticali, pericarpio laevi aut reticulato.

Typus sectionis: *Arachis glabrata* Benth.

Plants perennial, rhizomatous. Taproot, without thickenings. Branches procumbent. Leaves tetrafoliolate. Flowers along the length of the branches. Hypanthium well developed. Standard expanded, orange, rarely yellow. Fruit subterranean, biarticulate; peg and isthmus short, of more or less vertical growth.

Geographic distribution. The tetraploid species of this section occupy a central position within the overall range of the genus *Arachis* which corresponds to the range of *A. glabrata* var. *glabrata*.

The diploid species, *A. Burkartii*, grows more to the south and has a range with practically no overlap with those of the other rhizomatous species, except for a small fringe in the extreme NE of Corrientes and in the SE of Misiones (Argentina), where they grow, nevertheless, in different environments.

Key for distinguishing the species

A. Leaflets coriaceous, with the margin marked on both surfaces. Standard with reddish lines on both surfaces. 2n=20 chromosomes. Series *Prorhizomatosae*

40. *A. Burkartii*

A'. Leaflets with the margin somewhat marked only on the lower surface. Standard with reddish lines on the upper surface. 2n=40. Series *Rhizomatosae*

B. Plant completely prostrate, with the leaves adpressed to the soil. Upper leaf surface shiny, commonly with small scattered bristles. Pericarp reticulate.

41. *A. pseudovillosa*

B'. Plant somewhat taller, with the leaves separated from the soil. Upper leaf surface smooth, without bristles. Pericarp smooth.

42. *A. glabrata*

C. Leaflets more or less oblong.

42a. var. *glabrata*

C'. Leaflets lanceolate.

42b. var. *Hagenbeckii*

Ser. Prorhizomatosae* Krapov. & W.C. Gregory *nov. ser.

Sect. Rhizomatosae ser. Prorhizomatosae Krapov. & W.C. Gregory, in Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts – Culture and Uses: 92, 1973, *nomen nudum*.

Perennes. Radix palaris, rhizomata adsunt. Rami procumbentes. Folia quadrifoliolata, insigniter marginata. Vexillum supra subtusque lineis rubescentibus.

Typus: Arachis Burkartii Handro

Perennial plant, rhizomatous. Taproot, without thickenings. Branches procumbent. Leaves tetrafoliolate. Leaflets coriaceous, with margin marked on both surfaces. Flowers along the length of the branches. Standard with reddish lines on both surfaces. Fruit subterranean, biarticulate. Pericarp smooth. 2n=20 chromosomes.

40. *Arachis Burkartii* Handro

Fig. 2,40

Handro, Arq. Bot. Estado São Paulo 3: 177-179,

táb. 42-43, 1958. Burkart, in Burkart, Flora Ilustrada de Entre Ríos 3: 623-4, fig. 289, 1987.

A. marginata auct. non Gardner, Bentham, Fl. bras. 15(1): 87, p.p., 1859. Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 762, p.p., 1933. Burkart, Darwiniana 3(2): 264, 1939. Hoehne, Flora Brasílica 25(2) part. 122: 16, p.p., 1940. Hermann, Agric. Monogr. USDA 19: 10, p.p., fig. 7, 1954.

A. marginata forma *submarginata* Hoehne, Flora Brasílica 25(2) part. 122: 16, 1940, *nomen p.p.*

Perennial plant, rhizomatous; rhizomes shallow, branched, rooting, elongated, 2-3 mm in diameter, the young parts thinner, scaly. Stems very short, upright or reclining, almost completely covered by the stipules. Leaves tetrafoliolate. The fused portion of the stipules up to 7 mm long x 7 mm wide, the free tips acute, up to 12 mm long. Petiole usually short, 10-20 mm long, but may reach 75 mm in length in some cases. Rachis ordinarily ca. 5 mm long (rarely up to 10 mm). Leaflets obovate, rounded or cuneate, sometimes obovate-lanceolate, apex obtuse, rounded or acute, mucronulate (in dried specimens the apex may be split), coriaceous, with marked margin, especially on the lower surface; the apical pair always somewhat larger than the basal pair, up to 25 mm long x 11 mm wide, in cultivated material up to 33 mm long x 17 mm wide. Stipules with the surfaces almost glabrous, the fused portion villous on the back, margin ciliate. Petiole somewhat canaliculate, usually villous, sometimes with scattered hairs, but always with hairs ca. 2 mm long, occasionally with some bristles present. Leaflets with brilliant upper surface, usually glabrous or with long sparse, caducous hairs; the lower surface usually villous, sometimes subglabrous, with scattered adpressed hairs, rarely with some bristles; margin weakly ciliate and sometimes with some short bristles. Inflorescences axillary, few-flowered, axis short, covered by the stipules. Hypanthium 6-12 cm long, pilose. Calyx bilabiate, villous, with long silky hairs and some long thin bristles; the wide lobe 6-8 mm long, the narrow lobe falcate, 7-9 mm long. Standard 14-17 mm long x 17-20 mm wide, yellow at the base and orange toward the margin (rarely completely yellow), with reddish lines on both surfaces; wings 8-11 mm long, usually yellow toward the base and orange toward the apex. Fruit biarticulate; pegs 2-4.5 cm long; isthmus ca. 5 mm long; articles some 13 mm long x 7 mm wide. 2n=20 chromosomes (Gregory & al. 1973).

Holotype: BRAZIL. Rio Grande do Sul. 12 km north of Sant'Anna, 13-XI-1936, W.A. Archer 4439 (SP 45487!). Isotypes: IAN!, K!, NY!, US!.

Selected additional material: ARGENTINA. **Corrientes.** Dep. Ituzaingó: ruta 38 y río Aguapey, 21-III-1981, Tressens 1238 (CTES); ruta 34, 12 km E de ruta 12, 15-XII-1984, Tressens & al. 2975 (CTES). Dep. Santo Tomé: Garruchos, 25-IV-1969, Pedersen 9147 (CTES, Herb. Pedersen); 20-IX-1974, Krapovickas & al. 25779 (CTES); 15 km E de Virasoro, 5-II-1972, Krapovickas & al. 21038 (CTES); Santo Tomé, 1-II-1976, Krapovickas 29082 (CTES); Ea. Timbó, ayo. Ciriaco y ruta 40, 27-II-1983, Schinini & al. 23420 (CTES). Dep. San Martín: Torrent, 13-XII-1944, Ibarrola 1662 (LIL); Tres Cerros, 14-II-1979, Schinini & al. 17203 (CTES); Burkart 8166 (SI). Dep. Paso de los Libres: Campo Gral. Avalos, 7-IV-1972, Carnevali 3141 (CTES); Bonpland, 27-III-1964, Krapovickas & al. 11300 (CTES); parada Pucheta, 17-II-1979, Ahumada 2502 (CTES); ayo. Ayuí, 17-II-1979, Schinini & al. 17277 (CTES). Dep. Mercedes: Solari, 8-III-1945, Ibarrola 2590 (NY, SI); 26-III-1964, Krapovickas & al. 11285 (CTES); 61 km N de Mercedes, 5-III-1973, Quarín & al. 932 (CTES); 38 km E de Mercedes, 19-V-1968, Hammons & al. 355 (CTES); Mercedes, 11-III-1953, Krapovickas 7967 (LIL, US); 11 km S de Mercedes, cerro Pajarito, 23-II-1984, Tressens & al. 2435 (CTES); ayo. Yuquerí, camino a Itá Corá, 21-II-1984, Tressens & al. 2313 (CTES). Dep. Monte Caseros: Colonia Libertad, 27-III-1964, Krapovickas & al. 11301 (CTES); Campo Gral. Avalos, ayo. Curupi, 23-II-1979, Schinini & al. 17598 (CTES); Monte Caseros, 27-III-1947, Nicora 4728 (SI); id., 29-X-1950, Nicora 5584 (SI); id., 28-III-1964, Krapovickas & al. 11306 (CTES); Mocoretá, rio Mocoretá, 10-XI-1980, Ahumada & al. 3879 (CTES); San Francisco, 33 km SW de Monte Caseros, 12-IX-1979, Schinini & al. 18803 (CTES). **Entre Ríos.** Dep. Federación: rincón del Mocoretá y el río Uruguay, Burkart 21775 (SI); Federación, 20-XII-1946, Meyer 11102 (LIL). Dep. Concordia: San Carlos, 12-XII-1946, Meyer 10946 (LIL); Concordia, 6-II-1927, Burkart 888 (SI); Chajarí, Burkart 8167 (SI). **Misiones.** Dep. Apósto-

les: ayo. Chimiray, Ruta 40, 10-IX-1978, Krapovickas 34141 (CTES); Azara, 1,5 km E de Ruta 40, camino al puerto, 2-II-1976, Krapovickas & al. 29116 (CTES); 4 km N de San José, 20-III-1983, Cristóbal & al. 1899 (CTES).

BRAZIL. **Rio Grande do Sul.** Isabelle 1833 (K); Rio Grande, 1833, Gaudichaud 1991 (P); Montenegro, Deslandes s/n (SP); Tupancireta, 11-XI-1936, Archer 4429 (IAN, K, LIL, NY, SP, US); 26-I-1942, Rambo 9173 (PACA); 28-I-1942, Rambo 9613 (PACA); 28-I-1942, Rambo 9973 (LIL); 30-I-1942, Rambo 9980 (PACA); Julio de Castilhos, 11-XI-1967, Hagelund 5482 (CTES); Giruá, 18-XI-1974, Hagelund 8317 (CTES); Alegrete, Río Ibira Puitan, 13-III-1948, Palacios & al. 1816 (LIL); Alegrete, ayo. Capivari, 14-III-1948, Palacios & al. 1758 (LIL); camino de Alegrete a S. Francisco, 8 km de Passo Novo, Nicora 4695 (SI); 10 km SE of Alegrete, 21-V-1968, Hammons & al. 364 (CTES); id., 18-XII-1981, Arbo & al. 2449 (CTES); 55 km W de Rosario do Sul, 8-XII-1978, Krapovickas & al. 34237 (CTES); 14 km W de Rosario do Sul, 19-I-1973, Krapovickas & al. 22792 (CTES); 11 km NW de Minas do Camaqua (mun. Caçapava do Sul), 6-XII-1978, Krapovickas & al. 34203 (CTES); S. Gabriel, Faz. Sta. Cecilia, I-1944, Rambo 25703 & 25829 (PACA); São Luiz, Caaró, 13-VIII-1954, Rambo 53309 (PACA); São Pedro ad. fl. Ibicuí, II-1946, Rambo 34446 (PACA); Santa Ana do Livramento, Cerro do Registro, 24-II-1947, Castellanos (LIL 15981); Livramento, Morro Vigia, 12-I-1944, Rambo 3910 (PACA); Uruguaiana, Rambo 63224 (PACA); Uruguaiana, 24-I-1948, Palacios & al. 232 (LIL); 14 km E de Uruguaiana, 21-V-1968, Hammons & al. 362 (CTES); Uruguaiana, 10-XII-1945, Swallen 7659 (US); Camino Itaquí a Uruguayana, 17-V-1963, Rosengurtt & al. 9467 (MVFA); Quaraí, Faz. do Jarau, I-1945, Rambo 26031 (LIL, PACA); Torres, Campo Bonito, 26-X-1978, Waechter 1021 (ICN); id., 10-II-1983, Krapovickas & al. 38473 (CEN, CTES); id., 21-V-1983, Valls & al. 7363 (CEN, CTES); Caçapava do Sul, BR-153, km 64,6, 4 km N do rio Camaquá, 30-I-1982, Valls & al. 6898 (CEN); São Luiz Gonzaga, BR-285, km 447, 15-V-1983, Valls & al. 7317 (CEN, CTES). Mun. Santo Antonio das Missões: BR-285, a 400 m N do rio Icamaquá, 15-V-1983, Valls & al. 7320 (CEN, CTES). Mun. Itaquí: BR-472, km 53, 16-V-1983, Valls & al. 7330 (CEN, CTES); BR-472, 5,5 km S de Itaquí, 16-V-1983, Valls & al. 7333 (CEN, CTES). Mun. Uruguaiana: BR-472, km 151, 16-V-1983, Valls & al. 7334 (CEN, CTES); BR-472, 20 km S de Uruguaiana, 17-V-1983, Valls & al. 7335 (CEN, CTES); 1 km S do arroio Matapí, BR-472, km 216, 17-V-1983, Valls & al. 7337 (CEN, CTES); 21 km E de Uruguaiana, BR-290, 18-V-1983, Valls & al. 7344 (CEN); 57 km E de Uruguaiana, BR-290, km 568, 18-V-1983, Valls & al. 7345 (CEN, CTES); Alegrete, rio Ibirapuitan, BR-290, 18-V-1983, Valls & al. 7347 (CEN, CTES); 30 km E de Alegrete, BR-290, 18-V-1983, Valls & al. 7349 (CEN). Mun. São Sepe: 1 km W do entroncamento BR-290/BR-392, 19-V-1983, Valls & al. 7357 (CEN, CTES). Mun. Encruzilhada do Sul, BR-290, rio Iruí, 19-V-1983, Valls & al. 7359 (CEN, CTES). Mun. Dom Pedrito: BR-293, río Ibicuí da Armada, 28-XI-1979, Pedersen 12565 (CTES, Herb. Pedersen); 39 km S de Cruz Alta, río Ivaí, BR-158, 30-XI-1980, Krapovickas & al. 37085 (CEN, CTES); Capão Seco, ruta a Pelotas, 12-XI-1969, Rosengurtt & al. 9241 (MVFA).

URUGUAY. Banda Oriental, Saint Hilaire 2364 (K, P). **Artigas.** Cuareim, 2-V-1901, Berro 1501, fl. naranja (MVFA); Cuareim, 2-V-1901, Berro 1897, fl. amarillo azufre (MVFA); Artigas, 5-XII-1943, Bartlett 21028 (US); Sarandí, 22-III-1984, Pedersen 13896 (CTES, Herb. Pedersen); ayo. Catalancito, 30-I-1948, Castellanos (LIL 15979); Bella Unión, 23-I-1942, Rosengurtt B 3715 (MVFA, SI); id., 29-III-1962, del Puerto 1949 (MVFA); Tres Cruces, 1-III-1944, Rosengurtt B 4587 (MVFA, SI); Colonia Rivera, 18-VI-1950; Rosengurtt B 6025 (MVFA); Santa Rosa, III-1922, Schroeder (Osten 16703) (MVM); ayo. Yucutuyá y río Cuareim, Ea. El Ombú de Mallo, 13-IV-1978, del Puerto & al. 15363 (CTES, MVFA); ayo. Cuaró, próx. río Cuareim, 21-XI-1976, del Puerto 13078 (MVFA); Tomás Gomensoro, 9-I-1971, Marchesi 10037 (MVFA); Catalán, ruta 30, 4-XII-1957, Rosengurtt B 6842 (MVFA); Ruta 30, km 679, 4-II-1966, del Puerto & al. 5961 (MVFA); Ruta 30, km 83, 2-IV-1986, del Puerto & al. 18171 (MVFA); Campo de La Estanzuela, ruta 3 y bifurcación a T. Gomensoro, 21-X-1961, Millot 545 (MVFA). **Rivera.** Tranqueras, Arechavaleta, Herb. Osten 4105 (MVM); id., XI-1899, Arechavaleta 5369, 5369a (MVM); id., 19-III-1913, Osten 6525 (MVM); id., 18-II-1945, Legrand 4161 (MVM); id., 30-IV-1968, Hammons & al. 27 (CTES); Tranqueras, declives de la Cuchilla Negra, I-1941, Legrand 2409 (MVM); 74 km N de Tacuarembó, Ruta 5, 29-IV-1968, Hammons & al. 24 (CTES); Rivera, 10-I-1944, Legrand 3447 (MVM, SI); Rivera, Archer 4449 (SP, US); Cerro Aurora, 10-II-1961, Arrillaga & al. 1008 (MVFA); Paso Platón, 15-III-1962, del Puerto 1795 (MVFA). **Tacuarembó.** Tacuarembó, I-1899, Arechavaleta

5370 (MVM); id., I-1940, Legrand 1847 (MVM); camino a Borracho, 3 leguas de Tacuarembó, 11-III-1945, Rosengurtt B 4742 (MVFA, SI); Luján, 24-I-1977, Pedersen 11618 (CTES, Herb. Pedersen); 30 km NE de Tacuarembó, Ruta 5, 29-IV-1968, Hammons & al. 23 (CTES); Estación Experimental del Norte, 22-XI-1976, del Puerto 13039 (MVFA); Gruta de los Helechos, 10-III-1990, Izaguirre & al. 19730 (MVFA); Gruta de los Cuervos a Cerro Travieso, 3-XI-1990, Bayce & al. 19970 (MVFA); arroyo Laureles, 18-II-1968, Lema 6959 (MVFA). **Salto.** Salto, Osten 5374 (CORD, MVM, SI, US); Mirador Las Lavanderas, Salto, 28-IV-1968, Hammons & al. 16 (CTES); 4 km S de Salto, 28-IV-1968, Hammons & al. 17 (CTES); Ruta 4, km 106, 6-VI-1967, Izaguirre & al. 21003 (MVFA); Termas del Arapey, 15-I-1967, Rosengurtt & al. 10543 (MVFA). **Paysandú.** Arroyo Sacra, 1-II-1948, Osorio 13949 (MVM).

Geographic distribution. This species grows over a great part of the state of Rio Grande do Sul (Brazil), in the north of Uruguay, and in places near the Uruguay River in Argentina: in the south of Misiones, the east of Corrientes and the northeast of Entre Ríos. The southernmost localities are made up of the arroyo Sacra, a little to the south of the city of Paysandú, in Uruguay, and Capão Seco, near the city of Pelotas, in the southeast of Rio Grande do Sul.

This species prefers high places, with shallow, hard soils, and frequently with rocky outcroppings. One exception to this is the collection of Torres, Campo Bonito (Waechter 1021), in the extreme northeast of Rio Grande do Sul, near the border with Santa Catarina, where it grows in soil of nearly pure sand, in a population of *Butia capitata*.

Obs. *Arachis Burkartii*, with its 20 chromosomes, is the only diploid rhizomatous species and presents a quite remarkable genetic isolation, such that no hybrids were obtained from the numerous crosses attempted, be they with species within the same section or with species from other sections (Gregory, M.P. & Gregory 1979).

Ser. Rhizomatosae

Type species: *Arachis glabrata* Bentham

This series is differentiated from the series *Prorhizomatosae* principally because its species are tetraploid and due to its different genetic behavior such that, unlike *A. Burkartii*, its species can cross and produce hybrids with diploid species from other sections. Also, the ranges of the two series are different (fig. 8).

41. *Arachis pseudovillosa* (Chodat & Hassl.) Krapov. & W.C. Gregory *nov. comb.*

Figs. 2,41; 19,C,D

A. prostrata Benth, var. *pseudovillosa* Chodat & Hassl., Pl. Hassl. 2: 449, 1904.

Rhizomatous perennial; rhizomes shallow, branched, rooting, elongated, 2-3 mm in diameter, the younger parts more slender, densely pubescent, scaly. Stems extremely short, almost subterranean, with the leaves completely pressed against the soil. Leaves tetrafoliolate. The fused portions of the stipules 5-9 mm long x 4 mm wide, the free tips acute, 6-14 mm long. Petiole usually short, 4-16 mm long, rarely up to 31 mm long. Rachis 3-7 mm long, rarely 10 mm. Leaflets usually broadly obovate, rounded, apex obtuse, rounded or somewhat acute, mucronate, coriaceous, veins and margin marked only on the lower surface; the apical pair always somewhat larger and more rounded than the basal pair, apical pair up to 35 mm long x 23 mm wide, the basal pair up to 31 mm long x 19 mm wide. Stipules with the surfaces subglabrous, villous on the back of the fused portion, margin ciliate (cilia caducous), occasionally some bristles present only on the margin of the free portions. Petiole canaliculate, usually villous, sometimes with bristles; rachis somewhat less villous than the petiole. Leaflets with the upper surface shiny dark green, commonly with small scattered bristles; the lower surface usually villous, occasionally subglabrous, but always with plant residue and particles of soil clinging to the surface, margin with scattered bristles, and frequently in young leaves some short hairs. Inflorescences axillary, few-flowered, with short axis, covered by the stipules. Hypanthium 5-10 cm long, villous, with long

silky hairs. Calyx bilabiate, villous and frequently with some long delicate bristles; the broad lobe 7 mm long, the narrow lobe falcate, 7.5-8 mm long. Standard 13-15 mm long x 14-16 mm wide, with reddish lines on the upper surface, yellow toward the center with an orange margin, occasionally entirely yellow; wings 8 mm long, yellow. Fruit biarticulate; peg 3-5 cm long, covered toward the base with a short tomentum; isthmus ca. 1.5 cm long; articles 11-15 mm long x 6-7 mm wide, reticulate when mature, with beak, covered when young with a tomentum of short hairs that retain particles of soil. 2n=40 chromosomes (Fernández & Krapovickas 1994).

Lecto-holotype: PARAGUAY. "*Herba 0,05-0,15 m petala citrina, in campis pr. Ipé hú, Sierra de Maracayu, oct. (Hassler) n. 5069*" (G!). Isotypes: BM!, K!, NY!, P!, UC!.

We selected this specimen as the lectotype due to the abundance of material and because of its being distributed to a larger number of herbaria than the other syntype: "*petula aurantiaca, in campo pr. flumen Carimbatay, sept., (Hassler) n. 4511*" (BM!, G!).

Selected additional material: BRAZIL. **Mato Grosso do Sul.** 15 km N de Nioaque, BR-419, 11-II-1993, Hatschbach & al. 58909 (CTES, MBM); 5 km SW de Rio Brilhante, 12-V-1961, Gregory & al. 10555 (LIL, US); 28 km SW de Dourados, 12-V-1961, Gregory & al. 10558 (LIL, US); 9 km W de Caarapó, 19-1-1979, Krapovickas & al. 34334 (CEN, CTES); entre Ponta Porã e Dourados, 24-IV-1939, Otero 362 (SP); 35 km E de Ponta Porã, 15-V-1976, Hatschbach 38670 (CTES, MBM); Ponta Porã, Herb. Hassler 9886 (G); 7-10 km N de Ponta Porã, 11-II-1959, Gregory & al. 9625, 9626, 9627a, 9630 (LIL, US); id., 26-VI-1977, Krapovickas & al. 30130 (CTES); 22 km de Ponta Porã camino a Bela Vista, 19-II-1968, Krapovickas & al. 14055 (CTES); 40 km NW de Ponta Porã, camino a Bela Vista, 13-II-1959, Gregory & al. 9634, 9635 (LIL, US); Fazenda Nestor Qué, Campanario, 14-IV-1939, Otero & al. 283 (SP); 1 km N del Río Amambaí, camino Ponta Porã a Amambay, 17-II-1959, Gregory & al. 9664 (LIL, US); id., 14-V-1961, Gregory & al. 10565 (LIL, US); id., 10566 (LIL, US); id., 13-VI-1968, Hammons & al. 575 (CEN, CTES, US); 1 km E de Antonio João (Capitan Bado), camino a Amambaí, 17-II-1959, Gregory & al. 9678, 9679 (LIL, US); 20 km W de Amambaí, camino a Antonio João, 17-II-1959, Gregory & al. 9672 (LIL, US); 5 km de Amambaí, camino a Ponta Porã, 19-II-1959, Gregory & al. 9688, 9703 (LIL, US); 13 km ao N do rio Amambaí na estrada de Ponta Porã a Amambaí, 24-IV-1984, Valls & al. 7695 (CEN, CTES); 8,5 km ao Sul do rio Amambaí ao longo da estrada de Ponta Porã a Amambaí, 24-IV-1984, Valls & al. 7701 (CEN, CTES); a 3 km da praça central de Rio Brilhante e a 1,5 km do acesso sul a BR-163, 26-IV-1984, Valls & al. 7710 (CEN, CTES); 23 km a SE de Antonio João e 11 km NE do aceso a Maracajú na estrada para Ponta Porã, 8-IV-1986, Valls & al. 9932 (CEN, CTES). Mun. Guia Lopes da Laguna: on road (BR-267) from Maracajú to Guia Lopes, about 12 km W of Ervania, 24-X-1986, Pedersen 14710 (CTES, Herb. Pedersen).

PARAGUAY. **Amambay.** Finca Elvira, 20 km NW de Pedro Juan Caballero, 13-V-1961, Gregory & al. 10559 (LIL, US); Estancia San Luis, 20 km NW de Pedro Juan Caballero, 13-V-1961, Gregory & al. 10560, 10561 (LIL, US); Pedro Juan Caballero, Rojas 6481 (SI); 17-II-1951, Schwarz 11931 (LIL); Río Ipané, 18-VIII-1980, Schinini & al. 20434 (CTES); distr. Capitán Bado, San Fernando, 31-X-1986, Pedersen s/n (CTES).

Geographic distribution. This species grows in the Sierra de Amambay, along its total length and in adjacent areas, in the border region of Mato Grosso do Sul and Paraguay. It prefers open fields with short grass vegetation.

Obs. 1. In some localities, we observed plants of a size intermediate between *A. pseudovillosa* and *A. glabrata*, which were found growing together in: Brasil, Mato Grosso do Sul, 8-9 km north of Ponta Porã, Feb. 11, 1959, Gregory & al. 9627, 9628 (LIL); 1 km north of the Río Amambaí, 13-VI-1968, Hammons & al. 576 (CTES) and 577 (CTES, US); 5 km from Amambaí, 19-II-1959, Gregory & al. 9706 (LIL, US). Because of the presence of bristles on the upper surface of the leaves, these specimens most resemble *A. pseudovillosa.*

Obs. 2. In general, the genetic behavior of *A. pseudovillosa* is very similar to *A. glabrata*, but because we had a smaller number of sampled locations available, the results for the

former are more limited than in the latter species.

Hybrids were obtained between *A. pseudovillosa* and *A. glabrata* var. *glabrata* in two cases, but without data on the fertility of pollen.

Hybrids were also obtained with annual species of section *Arachis* such as *A. Batizocoi* and *A. duranensis*, with *A. Rigonii* of section *Procumbentes*, and with *A. paraguariensis* ssp. *paraguariensis* in section *Erectoides*, but the hybrids never did flower. A surprising case is the behavior of the hybrid between *A. pseudovillosa* and *A. Hermannii* of section *Erectoides*, with 46.1% pollen stain (p. 178 in M.P. Gregory & al. 1979).

Illustration: Otero, 19, 1941: photograph of specimen Otero 362, from Ponta Porã.

42a. *Arachis glabrata* Benth. var. *glabrata*
Fig. 2,42a

Bentham, Trans. Linn. Soc. London 18(2): 159, 1841, "*Ad Rio Pardo Brasiliae.* (v.s. comm. a Mus. Acad. Petrop. cum fl.)."

Bentham, Martius Fl. bras. 15 (1): 87, 1859, excl. fig. Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 759, 1933, *pro parte*. Hoehne, Flora Brasílica 25(2) part. 122: 19, táb. 14, fig. 1, 1940. Hermann, Agric. Monogr. USDA 19: 8, fig. 4, 1954. Conagin, Bragantia 21: 355, est. 8, figs. 6B & 15, 2n=40, 1962.

A. prostrata Benth. var. *genuina* Chodat & Hassl., Pl. Hassl. 2: 448, 1904, Hassler 8439 (G!).

A. prostrata Benth. var. *pseudomarginata* Chodat & Hassl., Pl. Hassl. 2: 449, 1904, lectotype: Paraguay, Atira, Hassler 3445 (G!).

A. glabrata Benth. var. *membranifolia* [Benth.?] ex A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9(90): 100, 1929, *nomen nudum*, "A. de Saint Hilaire no. 367." São Paulo, Ribeirao Corrente (K!).

A. glabrata Benth. forma *major* Hoehne, Flora Brasílica 25(2) part. 122: 20, táb. 15, 1940, *nomen nudum*.

A. glabrata Benth. forma *minor* Hoehne, Flora Brasílica 25(2) part. 122: 20, táb. 14, fig. 2, 1940, *nomen nudum*.

Perennial, rhizomatous plant with robust taproot. Rhizomes at a depth of 5-20 cm, ramified, rooting, very extended; in year-old plants the rhizomes originate on the basal nodes of the cotyledonary branches. Aerial stems to 40 cm long, decumbent, scandent, pubescent to glabrous. Leaves tetrafoliolate. Stipules subulate, villous to glabrescent, sometimes with some bristles. Leaflets oblong, elliptical or obovate, with the margin somewhat marked on the underside. Upper leaf surface usually glabrous, but younger leaves may exhibit some very short, scattered hairs. Lower leaf surface with adpressed hairs to subglabrous, and frequently with hairs somewhat longer on the midvein. Spikes pauciflorous, very short, axillary. Hypanthium well developed, villous. Calyx villous and with abundant bristles. Standard orange, rarely yellow, with red lines on the upper surface. Fruit subterranean, biarticulate; peg 5-10 cm long, with short isthmus; pericarp smooth. 2n=40 chromosomes (Gregory & al. 1973).

Holotype: BRAZIL. Mato Grosso do Sul. Rio Pardo, Riedel 107 Hb. Mus. Petr. 1837 (K!).

Selected additional material: ARGENTINA. **Corrientes.** Dep. Santo Tomé: ayo. Chimiray y ruta 40, 12-IV-1974, Krapovickas & al. 25225 (CTES). Dep. Ituzaingó: 25 km E de Ituzaingó, 15-I-1966, Krapovickas & al. 12000 (CTES, NY, US). Dep. San Miguel: Colonia Madariaga, 17-II-1946, Ibarrola 4229 (CEN, CTES, G, LIL, MO); Loreto, 25-I-1959, Gregory & al. 9553 (LIL, US). Dep. General Paz: Puisoyé, 25-X-1945, Ibarrola 3610 (CTES, LIL). Dep. Empedrado: Empedrado, 3-III-1950, Schwarz 9973 (CEN, CTES, LIL); Rincón del Madrejón, 2-III-1972, Carnevali 2978 (CTES). Dep. Mburucuyá: Mburucuyá, 3/5-III-1945, Hunziker 6683 (CORD, LIL); Estancia Santa Teresa, 26-XII-1976, Krapovickas & al. 30044 (CEN, CTES, GH, K, MO, NY, US). Dep. Saladas: Saladas, laguna Soto, 23-IX-1944, Schwarz 4 (LIL). Dep. Concepción: Tabay, 1-XI-1965, Krapovickas & al. 11609 (CEN, CTES, G, US). **Misiones.** Dep. San Martín: Puerto Tabay, 30-XI-1945, Schwarz 1578 (K, LIL). Dep. Cainguás: Campo Grande, 1-XI-1946, Pierotti 5297 (LIL). Dep. San Ignacio: Colonia Corpus, 20-X-1948, Schwarz 6456 (CTES, LIL); San Ignacio, 27-I-1947, Meyer 11727 (LIL). Dep. San Javier: San Javier, 14-II-1947, Huidobro 5182 (LIL). Dep. Concepción: Concep-

ción de la Sierra, 1-II-1948, Schulz 6930 (CTES); 16 km NW de Concepción de la Sierra, 11-III-1969, Krapovickas & al. 15107 (CTES). Dep. Apóstoles: Azara, 7-IX-1977, Fernández 363 (CTES); Pindapoy, 13-I-1937, Clos 5981 (BAB); Apóstoles, 26-I-1926, Clos 1918 (BAB). Dep. Candelaria: Picada Güemes, 21-II-1947, Huidobro 4872 (CTES, LIL); Ayo. Máquina, 10 km E de Santa Ana, ruta 105, 11-XI-1972, Mroginski 781 (CTES); Bonpland, Jörgensen 191 (BAB). Dep. Capital: 20 km W de San José, cerca del arroyo Pindapoy, 8-III-1953, Krapovickas 7934 (CEN, CTES, LIL, US); Posadas, La Granja, 12-XI-1907, Ekman 1719 (NY).

BRAZIL. **Goiás**. Mun. Jatai: Balsamo, 1-XI-1950, Macedo 2694 (LIL, US). Mun. Rio Verde: Rio Verde, 17-III-1959, Gregory & al. 9947 (GH, LIL, MO, NY, SI, US). Mun. Alagarças: Alagarças, 28-I-1945, Shimoya 3593 (US). Mun. Bom Jesus: BR-452, km 140 W do acesso a Santa Rosa, 23-IV-1980, Valls & al. 5115 (CEN); 33 km de Bom Jesus, 18-III-1959, Gregory & al. 9951 (GH, LIL, MO, NY, SI, SP, US). Mun. Itumbiara: Itumbiara, 18-III-1959, Gregory & al. 9954 (LIL, MO, NY, SI, SP, US). Mun. Goiatuba: Goiatuba, 5-IV-1961, Gregory & al. 10139 (LIL, NY, US). Mun. Parauna: Rio Verdao, BR-060, km 172, 24-IV-1980, Valls & al. 5153 (CEN). **Mato Grosso.** 70 km N de Cuiabá, camino a Rosario do Oeste, 11-III-1959, Gregory & al. 9918 (LIL, NY, SI, US). Mun. Barra do Garças: Barra do Garças, 4-X-1968, Fonseca & al. 1094 (NY, UB). Mun. Rondonópolis: Rondonópolis, 18-XI-1975, Hatschbach 37674 (CTES, MBM); Rondonópolis, 8-III-1959, Gregory & al. 9893 (GH, LIL, NY, MO, US). Mun. Pedra Preta: 32 km SSE de Rondonópolis, BR-364, 3-IX-1981, Valls & al. 6442 (CEN, CTES); Birro, entre Rondonópolis y Alto Garças, 15-III-1959, Gregory & al. 9935 (LIL, GH, MO, NY, SI, US). **Mato Grosso do Sul.** Mun. Ribas do Rio Pardo: Rio Pardo, X-1826, Riedel 604 (K p.p., P, US); Ribas do Rio Pardo, 3-III-1959, Gregory & al. 9827 (GH, LIL, MO, NY, SI, US); id., Gregory & al. 9830 (LIL, GH, MO, NY, SI, US). Mun. Campo Grande: Campo Grande, 25-XII-1932, Otero 10 (RBR, SP); Campo Grande, Capao Bonito, 6-IX-1936, Archer & al. 98 (NY, US); Campo Grande, Fazenda Experimental de Criaçao, 24-II-1959, Gregory & al. 9813 (LIL, US); 70 km S de Campo Grande, 1-III-1959, Gregory & al. 9806 (CEN, CTES, GH, LIL, MO, NY, SI, SP, US). Mun. Rio Verde: Rio Verde, 13-XII-1976, Krapovickas & al. 30020 (CTES, NY, US); 52 km N de Rio Verde, 7-III-1959, Gregory & al. 9882 (LIL, MO, NY, US). Mun. Anastacio: Palmeiras, 17-II-1970, Hatschbach 23729 (CTES, MBM); 41 km S de Aquidauana, Faz. Varzea Alegre, 30-VI-1977, Krapovickas & al. 30143 (CTES). Mun. Aquidauana: Aquidauana, Faz. Santa Cruz, 17-VII-1969, Hatschbach 21924 (CTES, MBM). Mun. Miranda: estrada Miranda-Capao, 15-XII-1976, Shepherd & al. 4103 (CEN). Mun. Jardim: 8 km W de Jardim, 10-VI-1968, Hammons & al. 563 (CEN). Mun. Porto Murtinho: 51 km E de Porto Murtinho, 12-VI-1968, Hammons & al. 567 (CTES); id., Hammons & al. 569 (CTES). Mun. Nioaque: 27 km S de Nioaque, camino a Jardim, 10-VI-1968, Krapovickas & al. 14425 (CEN, CTES). Mun. Maracaju: Maracaju, 3-II-1952, Kuhlmann (SP 69920). Mun. Nova Andradina: Faz. Douradinho, 11-XI-1975, Hatschbach 37397 (CTES, MBM). Mun. Rio Brilhante: Rio Vacaria, 24-X-1970, Hatschbach 25177 (CTES, MBM, NY); 10 km E de Entroncamento, 1-III-1959, Gregory & al. 9797 (LIL, MO, NY, US); 5 km E de Entroncamento, 11-V-1961, Gregory & al. 10550 (LIL, US). Mun. Caarapó: 9 km W de Caarapó, 19-I-1979, Krapovickas & al. 34593 (CEN, CTES, G, K, LIL, MBM, US). Mun. Bela Vista: Bela Vista, 8-V-1939, Otero & al. 387 (SP); Bela Vista 14-II-1959, Gregory & al. 9645 (LIL, GH, MO, NY, SI, SP, US). Mun. Antonio João: 10 km W de Penso [now Antonio João], 13-II-1959, Gregory & al. 9637 (GH, LIL, MO, NY, US). Mun. Ponta Porã: Ponta Porã, 18-IV-1939, Otero 327 (RBR, SP). Mun. Amambay: Antonio João [now Coronel Sapucaia, across from Capitán Bado, Paraguay], 18-II-1959, Gregory & al. 9681 (LIL, MO, NY, US); 1 km N del rio Amambay, 17-II-1959, Gregory & al. 9667 (LIL, GH, MO, NY, US). **Minas Gerais.** Mun. Ituiutaba: Ituiutaba, 27-X-1944, Macedo 568 (LIL). Mun. Prata: 100 km N de Frutal, 19-III-1959, Gregory & al. 9964 (GH, LIL, MO, NY, SI, US). Mun. Frutal: 10 km S de Frutal, 19-III-1959, Gregory & al. 9966 (LIL, MO, NY, SI, US). Mun. Uberaba: 28 km de Uberaba na estrada a Belo Horizonte, 15-X-1966, Duarte 772 (NY). **São Paulo.** Faz. Guanabara, Ilha Seca, 2-VIII-1936, Hoehne & al. (SP 45842); Piraçununga, Emas, 13-IX-1946, Kuhlmann (SP 80244); Matao, 12-I-1980, Krapovickas & al. 35249 (CEN, CTES, US). Mun. Tanabí: Vila Monteiro, 21-VIII-1941, Gehrt (SP 45842). Mun. Barbosa: SP-425, 25-IX-1975, Hatschbach & al. 37125 (CTES, MBM). Mun. Santa Cruz do Rio Pardo: 2 km E del río Pardo, Posto Taquarí, SP-280, km 186, 1-II-1987, Krapovickas & al. 40989 (CTES). Prov: S. Paulo, St. Hilaire 991 bis (P).

PARAGUAY. **Alto Paraná.** 20 km N de

Hernandarias, 10-I-1974, Schinini 8055 (CTES). **Amambay.** Pedro Juan Caballero, I-1934, Rojas 6666 (SI); Portera Ortiz, 7 km N de P.J. Caballero, 11-II-1959, Gregory & al. 9629 (LIL, GH, MO, NY, US); cursus superioris fl. Apa, II-1902, Hassler 8439 (G, K, NY, P, UC); Cerro Corá, 16-VIII-1980, Schinini & al. 20178 (CTES, G, MO); Bela Vista, 14-II-1959, Gregory & al. 9643 (GH, LIL, MO, NY, SI, US). **Caaguazú.** Km 90, ruta Asunción-Oviedo, 25-I-1949, Rosengurtt B-5557 (SI): km 116, ruta Asunción-Caaguazú, 3-II-1959, Gregory & al. 9591 (LIL, GH, MO, NY, US). **Central.** Yaguarón, 1-II-1966, Krapovickas & al. 12290 (CTES, NY, US); San Lorenzo, XII-1936, Archer & al. 7470 (SI); Asunción, Santísima Trinidad, 5-I-1937, Archer 4904 (K, LIL, SP, UC, US); Luque, I-1949, Rojas & al. 14152 (SI). **Concepción.** Fluminis Aquidaban, X-1901, Hassler 7664 (G, UC); San Salvador, II-1917, Rojas 2931 (LIL, SI); Puerto Rizzo, 17-I-1955, Meyer & al. 18693 (LIL); 10 km W de Horquetas, 17-V-1961, Gregory & al. 10596 (LIL, MO, NY, US). **Cordillera.** Cordillera de Altos, 1902, Fiebrig 263 (G, SI); fluminis Yacá, pr. Valenzuela, II-1900, Hassler 7115 (G); 12 km N de Paraguarí, camino a Piribebuy, 7-II-1982, Schinini & al. 21947 (CTES). **Guairá.** Villarica, XII-1874, Balansa 1526 (G, K, P). **Itapúa.** San Miguel Curuzú, 3 km N de Villa Encarnación, 14-XII-1936, Archer 4655 (IAN, NY, SP, US); arroyo Porá, 7 km N de Encarnación, 28-I-1959, Gregory & al. 9567 (LIL, NY, US); Trinidad, 29-I-1959, Gregory & al. 9568 (LIL, NY, US); id., Gregory & al. 9570 (LIL, NY, US). **Misiones.** San Juan Bautista, X-1931, Rojas 5722 (SI); Santiago, estancia La Soledad, 20-X-1967, Pedersen 8664 (CTES, K, US, Herb. Pedersen). **Paraguarí.** Paraguarí, 4-IV-1885, Kurtz 225 (CORD); Paraguary, XII-1900, Hassler 6513 (G); río Tebicuarí, frente a Florida, 4-II-1966, Krapovickas & al. 12399 (CTES). **San Pedro.** Lima, estancia Carumbé, 8-X-1967, Pedersen 8547 (CTES, K, Herb. Pedersen); San Estanislao, VIII-1900, Hassler 4261 (G, K, P).

Common name. "mendoim do campo baixo" (Otero 1951: 175).

Geographic distribution. The range of this species, which is very polymorphic, has its southern limit in the north of Corrientes and the south of Misiones, in Argentina. It apparently does not cross the Paraguay River and is very common in eastern Paraguay where, for example, it forms part of the lawns of the plazas in the center of Asunción. Towards the north, it extends through the states of Mato Grosso do Sul and Mato Grosso, along the edges of the Mato Grosso Pantanal. Its northern limit is found at Rosario Oeste, some 70 km north of Cuiabá. Towards the east, its range extends through southeastern Goiás and the Mining Triangle to the state of São Paulo, where its eastern limit is found at Emas, near Pirassununga. In Brazil, it grows in the "cerrado," and in Paraguay and Argentina in open field formations. It is a good natural forage, much desired by livestock, for which reason it is always found heavily grazed and therefore difficult to identify.

Obs. 1. *Arachis glabrata* is very variable, even within a single population, and it was not possible to establish intraspecific taxa, except for the var. *Hagenbeckii*, which has a more or less defined range and rather narrow leaflets that facilitate its identification.

Obs. 2. Despite the morphological variation exhibited by *A. glabrata* var. *glabrata*, its behavior in intraspecific crosses is fairly uniform. Of eight hybrids obtained, in six the fertility fluctuated between 68.6 and 92.9% and in one 45.2% was obtained. One very interesting case is the result of the cross 10 x 84, in which was found 12.9% stained pollen. This value is very low, especially if one takes into account that both parents grow very near to one another, given that Trinidad (no. 10) is situated some 20 km to the north of the locality of no. 87 (7 km N of Encarnación) in southeastern Paraguay. It is evident that some type of genetic barrier has established itself at the intravarietal level.

In the crosses with species from other sections, 12 populations of *A. glabrata* var. *glabrata* were used, and eight hybrids were obtained with *A. duranensis*, eight with *A. Batizocoi*, and one with *A. stenosperma*, all annual species from section *Arachis*; five with *A. paraguariensis* ssp. *paraguariensis*, four with *A. Hermannii*, four with *A. major*, and two with *A. Benthamii* from section *Erectoides*; and two with *A. appressipila* and two with *A. Rigonii* from section *Procumbentes*. The great majority of these

hybrids never flowered, except for one hybrid with *A. major* with 29.3% pollen staining, one with *A. appressipila* with 22.2%, and one with *A. Batizocoi* with 0.03% (see p. 195 and Gregory, M.P. & Gregory 1979).

The hybrids between rhizomatous species and those from sect. *Arachis* did not produce a single flower, except for cross 19 (*A. Batizocoi*) x 94 (Hammons & al. 569) which flowered. The rhizomatous parent is a plant that clings to the ground, with very brilliant dark green leaflets, somewhat different from the rest of the *A. glabrata* material.

It is interesting to ratify that the four species of section *Erectoides* are sympatric with *A. glabrata*, but the species from sections *Arachis* and *Procumbentes* that participated in the crosses are allopatric with *A. glabrata* and among themselves.

Obs. 3. *Arachis glabrata* has the characteristics of a good forage plant and is being used for this purpose in Florida (USA) where various cultivars have been developed, like 'Arb,' selected from a collection made by W. Archer, on 9 Nov. 1939, in Campo Grande, Mato Grosso do Sul, Brazil (PI 118457) (Prine 1964), or 'Arbrook,' developed from material collected in Trinidad, Paraguay (Gregory & al. 9570, PI 262817) (Prine & al. 1986).

42b. *Arachis glabrata* Benth. var. *Hagenbeckii* (Harms ex Kuntze) F.J. Herm.

Hermann, Agric. Monogr. USDA 19: 9, figs. 5 & 6, 1954, based on *Arachis Hagenbeckii* Harms ex Kuntze.

A. Hagenbeckii Harms ex Kuntze, Revis. gen. pl. 3(2): 52-53, 1898, "Süd Paraguay: Caapucu; auch aus dem Gran-Chacogebiete bekannt (gesammelt von Hagenbeck)." Type: Gran Chaco, Hagenbeck (B, destroyed). Photo F2255 (reproduced in Burkart, Darwiniana 3(2): 266, lám. 20, 1939. Hoehne, Flora Brasílica 25(2) part. 122, táb. 11 fig. 2, 1940. Hermann, Agric. Monogr. USDA 19: 19, fig. 5, 1954. Conagin, Bragantia 21: 356-357, est. 9, figs. 7,A & 16, 1962, 2n=40.

A. prostrata Benth. var. *pseudomarginata* Chodat & Hassl. forma *angustifolia* Chodat & Hassl., Pl. Hassl. 2: 449, 1904, α *brevicalyx*, "flumen Corrientes," Hassler 5863 (G!), β *longicalyx*, "flumen Carimbatay," Hassler 4512 (G!). Lectotype: Hassler 5863 (G!).

A. marginata Gardner subsp. *Hagenbeckii* (Harms ex Kuntze) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 763, 1933.

A. prostrata Benth. forma *Hagenbeckii* (Harms ex Kuntze) Hoehne, Flora Brasílica 25(2) part. 122: 11, 1940.

A. prostrata Benth. subsp. *Hagenbeckii* (Harms ex Kuntze) Hoehne, Flora Brasílica 25(2) part. 122: 15, táb. 11, fig. 2, 1940.

A. angustifolia (Chodat & Hassl.) Killip ex Hoehne, Flora Brasílica 25(2) part. 122: 12, 1940, *excl. exiccatum*, based on *A. prostrata* var. *pseudomarginata* forma *angustifolia* Chodat & Hassl.

A. prostrata Benth. var. *angustifolia* Chodat & Hassl. ex Hoehne, Flora Brasílica 25(2) part. 122: 7 & 12, 1940. *nov. stat. pro syn.*

Perennial, rhizomatous plant. It is differentiated from the var. *glabrata* by its more elongated and pointed leaflets and by being more glabrous. 2n=40 chromosomes (Fernández & Krapovickas 1994).

Lecto-holotype: PARAGUAY. Dep. Paraguarí, "Caapucú, Süd Paraguay, IX-1892, herb. Otto Kuntze" [Hagenbeck] (NY!).

Selected additional material: ARGENTINA. **Corrientes.** Dep. Ituzaingó: Ituzaingó, I-1947, Spegazzini 10051 (BAB, SI); Ea. Valle, 24-XI-1950, Bertoni 5189 (CTES, LIL); 30 km E de Ituzaingó, 5-III-1953, Krapovickas 7904 (CTES, LIL, US); Puerto Valle, 30 km E de Ituzaingó, 2-X-1978, Schinini & al. 15679 (CTES); 20 km E de Ituzaingó, 20-IX-1970, Krapovickas & al. 16077 (CTES, GH); 50 km E de Itá Ibaté, ruta 12, 15-I-1966, Krapovickas & al. 11946 (CTES, NY, US). Dep. Berón de Astrada: Laguna Toroy, 21-X-1949, Schwarz 8395 (LIL). Dep. General Paz: 15 km S de General Paz, 4-III-1953, Krapovickas 7855 (CTES, LIL, US). Dep. San Miguel: 21 km S de Loreto, 7-III-1974, Schinini & al. 8227 (CTES); 6 km SW de San Miguel, 31-III-1974, Krapovickas & al. 24703 (CTES). Dep. Mburucuyá: Ea. Santa María, 26-XII-1976, Krapovickas & al. 30043 (CTES, NY, US).

PARAGUAY. **Caaguazú.** Pastoreo, 5-II-1959, Gregory & al. 9610a & b (LIL, US); Ruta 2, 9 km del cruce Cnel. Oviedo-Villa Rica, 20-IX-1970, Maruñack

127 (CTES, G, MO). **Canindeyú.** Fl. Carimbatay, IX-1898, Hassler 4512 (G); fl. Corrientes, XII-1898, Hassler 5863 (G); 46 km S de Katueté, 3 km N del río Itambery, ruta Puerto Stroessner-Saltos del Guairá, 18-III-1982, Schinini 23201 (CTES). **Central.** San Lorenzo, I-1937, Rojas 7566a (SI); San Lorenzo, 13-X-1981, Schinini & al. 21285 (CEN, CTES, G, GH); Itá, 29-I-1966, Krapovickas & al. 12142 (CTES, G, NY, US); Itá, 30-I-1966, Krapovickas & al. 12209 (CTES); Ayo. Mboiy, ruta 2, 1-I-1973, Schinini 5700 (CTES). **Cordillera.** Valenzuela, 20-XII-1950, Sparre & al. 1153 (LIL); Eusebio Ayala, 3-II-1959, Gregory & al. 9580 (GH, LIL, MO, NY, US); id., Gregory & al. 9587 (GH, LIL, MO, NY, US); 1 km N del ayo. Piribebuy, camino a Arroyos y Esteros-Tobatí, 7-II-1959, Gregory & al. 9618 (GH, LIL, MO, NY, US); Caacupé, 25-V-1964, Krapovickas & al. 11483 (CEN, CTES, G, MO); Emboscada, XII-1980, Bordas 1247 (CTES). **Guairá.** Villa Rica, Jörgensen 3637 (LIL, NY, US); Villa Rica, XI-1941, Rojas 9242 (SI); Villa Rica, 16-XII-1936, Archer 4664 (IAN, K, NA, NY, SP, UC, US); Jatatú, 8 km de Villa Rica, 16-XII-1936, Archer 4670 (IAN, NY, SP, US). **Misiones.** San Ignacio, 31-I-1959, Gregory & al. 9575 (GH, LIL, MO, NY, US). **Paraguarí.** Caapucú, 31-I-1959, Gregory & al. 9576 (GH, LIL, MO, NY, SI, US); 2 km N de Caapucú, 16-VI-1977, Krapovickas & al. 30107 (CTES, G, US); Colonia Piraretá, camino a Valenzuela, 21-XI-1950, Sparre & al. 453 (CTES, LIL). **San Pedro.** Primavera, 5/8-III-1954, Woolston 117 (K, SI); 4 km E de San Estanislao, 14-V-1974, Schinini 8864 (CTES); Ruta 3, 10 km S del río Aguaray Guazú, 14-V-1974, Schinini 8891 (CTES); 4 km NE de San Estanislao, 19-V-1974, Schinini 9103 (CTES, MO); San Estanislao, ruta 3, 14-XII-1983, Vanni & al. 217 (CEN, CTES, G, MO).

Geographic distribution. Among the polymorphisms of *A. glabrata*, the variety *Hagenbeckii* is easily recognizable by its narrow leaflets. It occupies a defined area within the range of the variety *glabrata*. The var. *Hagenbeckii* grows in the north of the province of Corrientes (Argentina) and in the south of Paraguay. Its northern limit is found in the departments of Canindeyú and San Pedro, in Paraguay.

IX. *Sect. Arachis*

Fig. 9

Sect. Axonomorphae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 92, 1973, *nomen nudum.*

Sect. Axonomorphae ser. Amphiploides Krapov. & W.C. Gregory, *loc. cit.* 1973, *nomen nudum.*

Sect. Axonomorphae ser. Annuae Krapov. & W.C. Gregory, *loc. cit.* 1973, *nomen nudum.*

Sect. Axonomorphae ser. Perennes Krapov. & W.C. Gregory, *loc. cit.* 1973, *nomen nudum.*

Plants annual or perennial, without rhizomes or stolons. Taproot, without thickenings. Mainstem erect, branches procumbent, spreading. Stipules with open margins. Leaves tetrafoliolate. Flowers distributed along the length of the branches. Hypanthium well developed. Standard always expanded, orange or yellow, without reddish lines on the dorsal surface or with a pinkish purple tinge (*A. Batizocoi*). Fruit subterranean, generally with two single-seeded articles or one multi-seeded article (*A. hypogaea*); peg vertical or inclined, not horizontal; pericarp smooth or reticulate.

Type species: *Arachis hypogaea* L.

Geographic distribution. The range of the section *Arachis* has a peculiar shape (fig. 9). It presents an axis that coincides more or less with the 57th and 58th meridians, that encompasses the watersheds of the Paraguay and Uruguay rivers and ends at the La Plata River. In the extreme northern part of this strip is located the Chapado dos Parecis, which separates the basin of the Paraguay River from that of the Amazon and which appears to be an obstacle that, due to its height, does not permit the range to extend further to the north at this place. On this central axis, the perennial species prevail, where almost all of them are found along watercourses and some of them are adapted to periodic flooding, like *A. Diogoi, A. helodes* and *A. Kuhlmannii,* as well as annual species, like *A. Hoehnei* and *A. valida,* that live in the Mato Grosso Pantanal where they are permanently exposed to large floods.

The two arms that extend toward the north correspond to the basin of the Tocantins River to the east and to the Mamoré and Guaporé river system to the west, between Trinidad and Guayaramerín, in Bolivia. In these two

northward expansions, the species encountered are annuals and most are adapted to conditions of prolonged inundation, as is the case of *A. benensis, A. trinitensis* and *A. Williamsii* in the Beni and of *A. palustris* in the Tocantins. Isolated at the eastern extreme is *A. stenosperma*, an annual species growing on the sands of the Atlantic coast, evidently carried there by the action of humans.

Expansion toward the southwest is constituted by annual species, like *A. Batizocoi, A. duranensis* and *A. ipaënsis*, which are adapted to conditions of periodic drought. Two of these extend from the dry "chaco" up to the first foothills of the Andes: *A. Batizocoi* (300 to 950 m elev.) and *A. duranensis* (250 to 1250 m elev.). These two species, together with *A. monticola* (1350 to 1560 m elev.), also an annual, are the ones that grow at the highest elevations of all the known wild species of the genus *Arachis*.

Obs. 1. In the genus, annual species occur only in section *Arachis* and in section *Heteranthae*. In the latter, its four constituents grow in the northeast of Brazil where the droughts are proverbial. The appearance of all of these annual species is very similar, with flowers distributed along the length of spreading and very long branches. Evidently, this biological type has shown itself to be an adaptive advantage that has made possible the occupation of new areas with extreme conditions of flooding or drought, expanding the range of its species toward the Amazon basin or to arid zones such as the Brazilian northeast or the foothills of the Andes, to eventually reach as much as 1500 m above sea level.

Also present in section *Arachis* are fruits with highly reticulate pericarps (fig. 3). This character is exclusive to this section and is present in a few perennial species, like *A. villosa*, from the Uruguay River, in the extreme southern part of the range of the genus, and *A. microsperma*, from the Apa River, on the border of Mato Grosso do Sul with Paraguay. On the other hand, there is a greater number of annual species with this kind of fruit, like *A. valida*, from Corumbá, in the Mato Grosso Pantanal, or *A. glandulifera, A. magna, A. ipaënsis* and *A. Williamsii* from Bolivia, or *A. monticola*, the only tetraploid wild species, from northwestern Argentina.

Obs. 2. In a first attempt to put the species of section *Arachis* in order (Gregory & al. 1973), it was clear that there were diploid perennial species (series *Perennes*), diploid annuals (series *Annuae*) and tetraploid annuals (series *Amphiploides*). Today, in light of the results of the experimental crosses conducted, this division is no longer so clear cut. There is a greater genetic affinity between the perennial species *A. Cardenasii, A. villosa, A. correntina* and *A. Diogoi* and the annuals *A. stenosperma* and *A. duranensis*, with whom they share the 'A' genome, than between these annuals and *A. Batizocoi* ('B' genome), or *A. glandulifera* ('D' genome), which are also annuals. There is evidence of other genomes, such as in the case of *A. ipaënsis*, which is closely related to *A. magna*, both of which are diploid and very similar to *A. monticola*, a tetraploid, both in plant habit and in the shape of the fruit. It is evident that new studies are still necessary to evaluate the characters that could be useful for organizing the species within section *Arachis*.

Key for distinguishing the species

A. Biarticulate fruit, articles separated by an isthmus. Peg fragile.

B. Plants annual or biennial.

C. Peg villous and with bristles.

D. Fruit articles reticulate.

43. *A. glandulifera*

D'. Fruit articles smooth.

44. *A. cruziana*

C'. Peg glabrous or with few hairs, without bristles.

E. Fruit articles markedly reticulate.

F. Underside of leaf subglabrous, with very small adpressed hairs and with a few long hairs on the midvein and on the margin.

G. Stipules with bristles.

H. Fruit articles up to 21 mm x 9 mm. 2n=40.

45. *A. monticola*

H'. Fruit articles up to 17 mm x 9 mm. 2n=20.

46. *A. magna*

G'. Stipules without bristles. Articles up to 17 mm x 10 mm. 2n=20.

47. *A. ipaënsis*

F'. Underside of leaf with hairs ca. 2 mm long on the midvein and on the margin.

I. Stipules without bristles. Fruit articles up to 17 mm x 10 mm.

48. *A. valida*

I'. Stipules with bristles. Articles up to 12 mm x 7 mm.

49. *A. Williamsii*

E'. Fruit articles smooth or slightly reticulate.

J. Standard yellow, with pinkish purple tinge on the dorsal surface. Stipules with bristles. Underside of leaf with hairs ca. 2 mm long.

50. *A. Batizocoi*

J'. Standard orange or yellow, without purple tinge.

K. Underside of leaf with hairs ca. 2 mm long, scattered.

L. Stipules without bristles. Upper side of leaf glabrous.

51. *A. duranensis*

L'. Stipules with bristles. Frequently also with long hairs on the upper surface of young leaves.

52. *A. Hoehnei*

K'. Underside of leaf glabrous.

M. Stipules without bristles.

N. Fruit articles 14-22 mm long x 5-7 mm wide.

53. *A. stenosperma*

N'. Fruit articles less than 13 mm long x 6 mm wide.

O. Calyx and hypanthium glabrous to subglabrous. Leaves glabrous.

54. *A. praecox*

O'. Calyx and hypanthium pilose.

P. Calyx with a few silky hairs, without bristles. Leaflets glabrous.

55. *A. palustris*

P'. Calyx villous and with bristles. Underside of leaf glabrous or with a few long hairs on the midvein.

Q. Stem with only a few hairs on the young parts.

56. *A. benensis*

Q'. Stem villous.

57. *A. trinitensis*

M'. Stipules, petiole and rachis with numerous bristles.

58. *A. decora*

B'. Plants perennial.

R. Underside of leaf with hairs ca. 2 mm long, upper side glabrous. Stipules without bristles. Fruit articles smooth.

59. *A. Herzogii*

R'. Underside of lea glabrous to villous, with hairs no greater than 1 mm long.

S. Fruit articles noticeably reticulate.

T. Articles up to 9 mm x 4 mm. Upper leaf surface glabrous, underside with adpressed hairs.

60. *A. microsperma*

T'. Articles 10-15 mm x 7-8 mm. Leaflets with both surfaces villous.

61. *A. villosa*

S'. Articles smooth or with reticulation barely marked.

U. Leaflets glabrous, with some short bristles on the margin.

62. *A. helodes*

U'. Leaflets with hairs, at least on the underside.

V. Leaflet margins with two kinds of trichomes: short adpressed hairs and long cilia (up to 2 mm long) and frequently with some bristles.

63. *A. correntina*

V'. Leaflet margins with one or two kinds of trichomes.

W. Fruit articles small, 7-11 mm long x 4-6 mm wide.

X. Leaflets with margin ciliate, outstanding on both surfaces.

64. *A. Simpsonii*

X'. Leaflets with margin marked only on the underside.

Y. On the lateral branches, leaflets always rounded, obtuse, large (L/W=1.4-1.7:1); margin ciliate and with some bristles.

65. *A. Cardenasii*

Y'. Leaflets smaller (L/W=1.6-2.9:1); margin with adpressed hairs and some bristles.

66. *A. Kempff-Mercadoi*

W'. Articles larger, 10-14 mm long x 5-7 mm wide.

Z. Leaflets from lanceolate to oblong-lanceolate (L/W=2.5-4.8:1); upper leaf surface with very small hairs.

67. *A. Diogoi*

Z'. Leaflets oblong-lanceolate to obovate (L/W=1.4-2.3:1); upper leaf surface glabrous.

68. *A. Kuhlmannii*

A'. Fruit not articulated, with 1-5 seeds. Peg tenacious.

69. *A. hypogaea*

43. *Arachis glandulifera* Stalker
Figs. 3,43; 24,B-D

Stalker, H.T., Amer. J. Bot. 78(5): 633-634, figs. 1-4, 1991.

Taprooted annual. Mainstem 50-120 cm long, growing erect at first but later trailing, branched and with flowers toward the base. Lateral branches trailing, 80-100 cm long. Stems semi-cylindrical to quadrangular, angular, villous, with two kinds of trichomes: short wavy hairs, long hairs more or less rigid from 1.5-2 mm long, and scarce broad-based bristle-like emergences. Internodes of the mainstem ca. 4 cm long, those of the lateral branches 5-10 cm long. Leaves tetrafoliolate. On the mainstem, the fused base of the stipules 5-6 mm long x 4 mm wide, the free tips 12 mm x 3 mm wide; petiole 3-5 cm long; pulvinus 2 mm long; rachis 10-15 mm long; apical leaflets usually 36-43 mm long x 18-21 mm wide, but up to 52 mm x 26 mm, basal leaflets usually 30 mm long x 34 mm wide, but up to 44 mm x 22 mm. On the lateral branches, the fused portion of the stipules 4-5 mm long x 3-3.5 mm wide, the free portion 7-9 mm long; petiole 10-16 mm in length up to 20-30 mm long toward the tip of the stem; rachis 7-10 mm long; apical leaflets 25-35 mm long x 12-18 mm wide, basal leaflets 17-25 mm long x 7-14 mm wide. Stipules with 6-8 longitudinal veins along the fused portion and a single prominent vein along the free portion, with two classes of trichomes: short, more or less wavy hairs, long, somewhat rigid hairs more abundant toward the base, and scattered bristles from the base almost to the apex of the tips, margin ciliate; petiole semi-cylindrical, canaliculate, villous, with short hairs, long hairs and bristles; leaflets eliptical, upper surface glabrous, lower surface villous with short hairs, long hairs along the midvein, and scattered bristles; margin somewhat thickened, ciliate and with some bristles. Calyx tube 10-55 mm long, villous with long silky hairs. Calyx bilabiate, villous with a few bristles, the broad lobe 7 mm long, 3-toothed, the narrow lobe curved, 8 mm long. Standard orange, up to 17 mm long x 20 mm wide; wings yellow, sometimes with upper half orange and lower half yellow, 11 mm long x 7 mm wide. Fruit biarticulate; peg 11-18 cm long, villous, with short hairs and some bristles; isthmus 3 cm long; articles 15-20 mm long x 10-12 mm wide, epicarp reticulate. 2n=20 chromosomes (Stalker 1991).

Holotype: U.S.A. North Carolina. Moore County; Sandhills Research Station, field D2, plot number 90 WSN 40, 12-IX-1990, Stalker 90-40 (without indication of the accession or its original locality) (NCSU). Isotypes: NA, US.

Material studied: BOLIVIA. **Santa Cruz.** Prov. Ñuflo de Chavez: Novicia, ca. 30 km S de Concepción, 16°29'S, 62°12'W, 500 m s.m., 1-V-1977, Krapovickas & al. 30091 (CEN, CTES, G, GH, K, LPB, MO, NY, SI, SP, US). Prov. Velasco: 21 km S de San Ignacio, camino a San Miguel, 16°33'S, 61°W, 400 m s.m., 7-V-1977, Krapovickas & al. 30098 (CEN, CTES, GH, LPB, MO, NY, US); 27 km S de San Ignacio, 7-V-1977, Krapovickas & al. 30099 (CEN, CTES, GH, LPB, MO, NY, US); San Miguelito, 23 km N de San Ignacio, 8-V-1977, Krapovickas & al. 30100 (CTES); comunidad San Miguelito, 100 km al N de San Ignacio, 20-XI-1987, Bruderreck 20 (CTES).

Geographic distribution. This species grows in the central part of the department of Santa Cruz (Bolivia), in the Provinces of Ñuflo de Chavez and Velasco.

Stalker (1991) with the accessions K 30091, 30098, 30099 and 30100, made intraspecific crosses that produced progenies with a high percentage of stained pollen and normal meiotic behavior. In the interspecific crosses he found that the hybrids of *A. glandulifera* with *A. duranensis* (genome A) and with *A. Batizocoi* (genome B), all diploids, showed a high degree of sterility, with very irregular meiosis. The attempts to cross *A. glandulifera* with *A. hypogaea* failed. In light of these results, Stalker proposed the genome D for *A. glandulifera,* which is different from the genomes A and B of section *Arachis.*

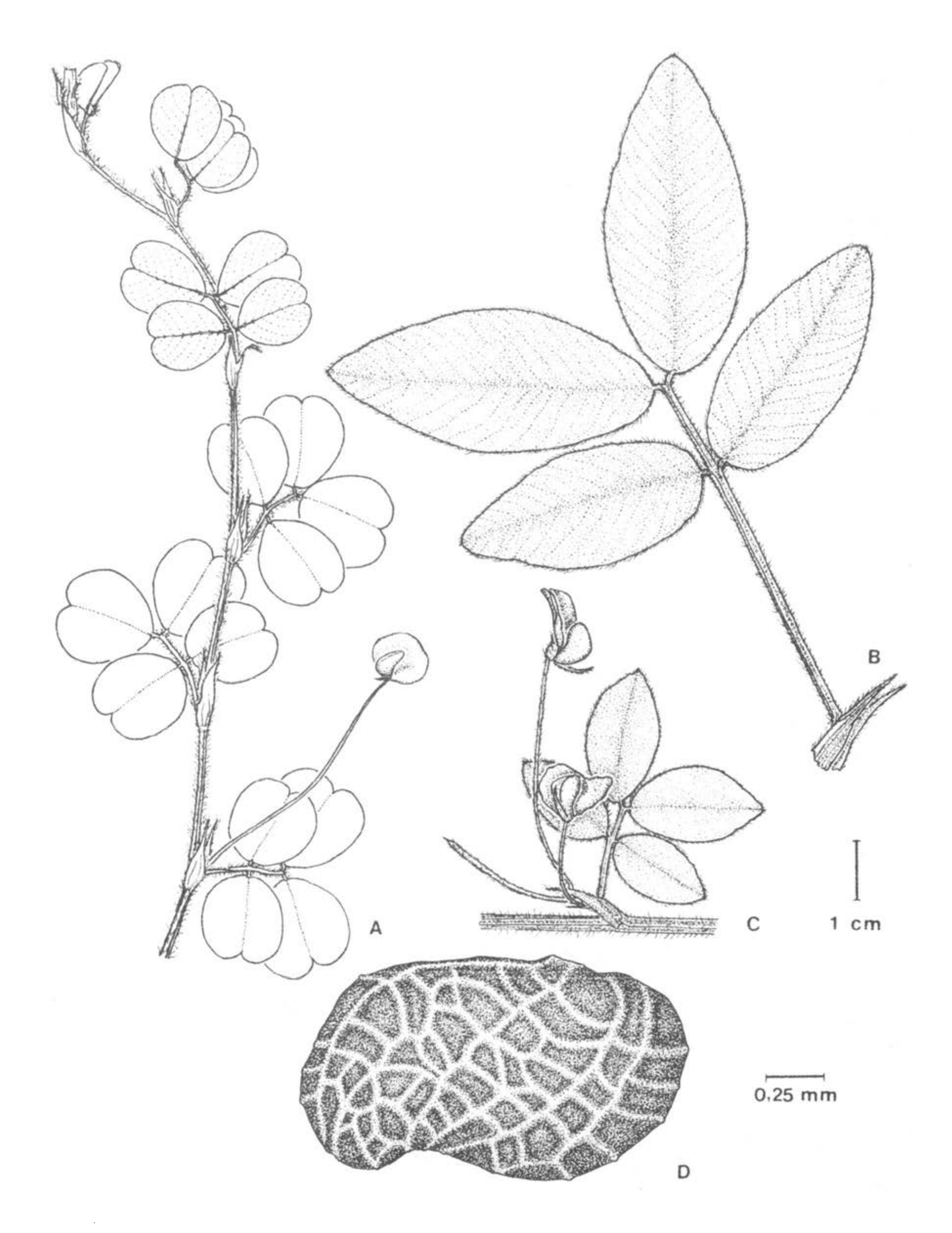


Fig. 24. *Arachis retusa*: A, branch (Pereira 1948). *A. glandulifera*: B, leaf from the mainstem; C, leaf from lateral branch; D, fruit article (K.30091).

44. *Arachis cruziana* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*
Fig. 3,44

Herba annua. Radix palaris, debilis. Caulis principalis 50-85 cm longus ramis prostratis. Caules villosi usque glabrescentes pilis ca. 2 mm longis setulisque base ampliatis sparsim vestiti. Stipulae setulis et pilis longis sparsis vestitae. Foliola oblonga usque obovata epiphyllo glabro, laevi, hypophyllo nervis et margine perspicuis pilis sparsis ca. 2 mm longis setulisque paucis vestito, margine pilis ca. 2 mm longis ciliato. Hypanthium villosum et setulosum. Vexillum aurantiacum. Fructus subterraneus, biarticulatus paxillo 10-17 cm longo, parte aerea villosa et setulosa, articulis 14-17 mm longis x 7-8 mm latis, apice recurvo, pericarpio laevi.

Holotype: BOLIVIA. Santa Cruz. Prov. Chiquitos, 2 km W de San José (60°47'W, 17°47'S), ca. 300 m s.m., en el km 263 del ferrocarril, en pastizal, anual, ramas postradas, 25-IV-1980, Krapovickas, Simpson & Schinini 36024 (CTES). Isotypes: CEN, LPB, MO, NY, US.

Annual plant. Taproot, weak. Mainstem 50-85 cm long, erect when young, later spreading; lateral branches prostrate, ca. 70 cm long; stem subcylindrical to quadrangular, villous, glabrescent, hairs ca. 2 mm long, and scattered wide-based bristle-bearing emergences; internodes 4-5 cm long on the mainstem and 5-10 cm long on the lateral branches. Leaves tetrafoliolate, distal leaflets from oblong to obovate, the proximal ones oblong, upper leaf surface glabrous, smooth, underside with scattered hairs 1.5-2 mm long and some bristles, veins and margins marked, margin ciliate, hairs ca. 2 mm long and a few bristles; stipules with bristles and with scattered long hairs, more abundant on the dorsal surface. On the mainstem, stipules with the fused portion up to 15 mm long, the free portion 15 mm long x 3 mm wide; petiole 35-45 mm long; rachis 7-15 mm long; distal leaflets 51-58 mm long x 23-25 mm wide, proximal leaflets 41-55 mm long x 19-22 mm wide. On the lateral branches, stipules with the fused portion 5 mm long, free portion 13-15 mm long x 2-2.5 mm wide; petiole 27-30 mm long; rachis ca. 10 mm long; distal leaflets ca. 30 mm long x 18 mm wide, proximal leaflets ca. 29-30 mm long x 14-15 mm wide. Hypanthium villous. Calyx villous and with bristles. Standard orange. Fruit subterranean, biarticulate, peg 10-17 cm long, villous on the aerial part and with bristles, articles 14-17 mm long x 7-8 mm wide, with beak, pericarp smooth. Seed 11-15 mm long x 5-8 mm wide.

Additional material: BOLIVIA. **Santa Cruz.** Prov. Chiquitos: 8-10 km NE de San José (60°47'W, 17°47'S), ca. 300 m s.m. En pequeña "pampa", suelo arena blanca; postrada, corola anaranjada, anual, 27-IV-1980, Krapovickas & al. 36026 (CTES, LPB, MO, NY, US).

Geographic distribution. It grows to the south of the Serranía de Chiquitos, in the vicinity of San José de Chiquitos, in the department of Santa Cruz (Bolivia), in places where the soil is almost pure sand.

45. *Arachis monticola* Krapov. & Rigoni
Fig. 3,45

Krapovickas & Rigoni, Darwiniana 11(3): 441-445, 1957.

A. pusilla auct. non Benth., Burkart, Darwiniana 3(2): 276, fig. 19,h, 1939.

Annual plant, taprooted. Mainstem erect, ca. 30 cm long, lateral branches procumbent, up to 1.10 m long. Stems brownish-violet in parts exposed to the sun, angular, more or less villous, with hairs ca. 2 mm long; internodes on the mainstem up to 3 cm long, on the lateral branches 2-6 cm long. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules 11-14 mm long, the free portion 23-25 mm long, subfalcate; petiole 34-43 mm long and rachis 12-14 mm long; leaflets oval-oblong, the apical pair 39-47 mm long x 20-23 mm wide, the basal pair 36-42 mm x 16-20 mm wide. On the lateral branches the fused portion of the stipules 7-10 mm long, the free portion 13-19 mm long; petiole 22-30 mm long and the rachis 8-10 mm long; leaflets from oval to obovate, obtuse, the apical pair 29-34 mm long x 20-23 mm wide, the basal pair 27-30 mm long x 16-20 mm wide. Stipule surfaces glabrous,

but may show some long hairs on the back of the fused portion; wings, back and basal half of the free tips with numerous rigid bristles; margin ciliate. Petiole and rachis canaliculate, subvillous and with a few scattered bristles, canal glabrous. Leaflets with the upper surface smooth, glabrous; the lower surface with midvein and margin barely marked, subglabrous, with barely visible diminutive adpressed hairs, frequently with some long hairs on the midvein, rarely a few long hairs on the rest of the surface; margin longly ciliate with one or two short bristles. Flowers along the length of the lateral branches, rarely at the tip of the mainstem. Spikes axillary, 5-flowered, of very short axis but may reach up to 5 cm in length at the base of the n+1 basal branches. Hypanthium villous, usually 5-6 cm long (3-7 cm). Calyx bilabiate, villous and with scattered bristles, upper lobe 6-7 mm long, lower lobe falcate 7-10 mm long. Standard suborbicular, up to 15 mm long x 17 mm wide, yellow at the base, otherwise orange with red radial lines on the upper surface; wings yellow, up to 10 mm long. Fruit subterranean, biarticulate; peg 7-14 cm long, subvillous;, isthmus 1.5-7 cm long; articles cylindrical, somewhat flattened at the apex, beaked, usually 15.5 mm long x 8.5 mm wide, the apical articles somewhat larger, up to 21 mm x 9 mm, pericarp tough, reticulate, with prominent longitudinal veins. Seed ca. 13.5 mm long x 6.5 mm wide; 2n=40 chromosomes (Krapovickas & Rigoni 1951 and 1957).

Holotype: Specimen cultivated in Manfredi (Córdoba, Argentina) from seeds collected in Yala (Jujuy, Argentina), III-1954, Krapovickas 8012 (BAB). Isotypes: AS, BAA, C, CTES, F, G, GH, K, LIL, MBM, MO, NY, P, SI, US.

Selected additional material: ARGENTINA. **Jujuy.** Dep. Dr. M. Belgrano: Yala, 1450 m, 14 km NW de Jujuy, 23-V-1950, Báez & al. 7264 (seeds from this collection were grown to produce the type specimen) (BAB, CTES, SI); Yala, 27-I-1940, Schreiter 11063 (LIL); Yala, 29-III-1977, Krapovickas & al. 30062 (CTES, G, GH, MO, NY, US); Jujuy, 7-IV-1945, O'Donell 2776 (LIL, NY, SI); Lozano, 20 km NW de Jujuy, 30-III-1977, Krapovickas & al. 30063 (CEN, CTES, G, GH, K, LIL, MO, NY, P, SI, US); Apeadero Reyes, 5 km S de Yala, 1261 m, 15-III-1982, Schinini & al. 21768 (CEN, CTES, G, LIL, MO, NY, SI, US); San Pablo, 3 km S de Yala, 1300 m, 15-III-1982, Schinini & al. 21769 (CEN, CTES, G, GH, LIL, MO, NY, SI, US). Dep. Humahuaca: Sierra de Zenta, 2800 m, 3-III-1929, Venturi 8354 (K, LIL, NY, SI, US).

Cultivated material: ARGENTINA. **Salta.** Estación Experimental Agrícola, INTA, Cerrillos, cultivar INTA LN 83-A, procedente de Jujuy, Lozano, 11-III-1982, Schinini & al. 21765 (CTES).

Geographic distribution. *Arachis monticola* occurs in the province of Jujuy (Argentina), where it was collected along the Rio Grande, in a small area some 10 km long, in the ravines of said river, between the localities of Lozano and Apeadero Reyes, where it forms very localized but dense populations between 1260 and 1565 m in altitude.

The collection Venturi 8354, in the Sierra de Zenta at 2800 m altitude, is doubtful since at this elevation the vegetation changes radically relative to the places where we observed this species. Our collections were made in an environment that fits in with the vegetational group "Distrito Chaqueño Serrano," of the "Chaqueña" vegetational province (Cabrera 1976: 27), which reaches some 1800 m above sea level where the dominant vegetation is xerophytic forest alternating with grassy steppe.

The elevation noted by Venturi corresponds better with the "Prepuneña" vegetational province, that in Jujuy occupies altitudes between 2000 and 3400 m (Cabrera 1976: 34), with precipitation below 200 mm annually and with vegetation consisting of shrubby steppe, stands of thistle, small dwarf forests and bromeliad cushions. Both the "Chaqueña" and the "Prepuneña" formations belong to "Dominio Chaqueño" vegetational domain.

It is interesting to note that Burkart crossed the Sierra de Zenta in February 1940 on a trip by mule from Ledesma to Humahuaca, without encountering a single specimen of *Arachis*.

Nevertheless, there is a very important historical fact: Salas (1945: 30) indicates that at the time of the Conquest, Omaguaca was a

province of uncertain extent and that within it was included the valley *"... quele llaman los españoles Del Mani."* ["...that the Spaniards call Peanut Valley."] and mentions a document dated June 15, 1596 in which it is clearly stated *"... quebrada de tumbaya ques la quebrada del many"* ["...Tumbaya Creek which is the creek of the peanuts"]. Tumbaya is found about 45 km north of San Salvador de Jujuy, at 2094 m altitude. Some 20 km to the north, in the Quebrada Purmamarca in Antigal de Ciénega Grande, Salas himself (1945: 258) found some peanut shells (*Arachis hypogaea* L.) in three graves, which indicates the cultivation of peanuts in times prior to the Conquest in places higher than the area known for *A. monticola*.

Obs. 1. *A. monticola* is the only species of section *Arachis* with the same number of chromosomes (2n=40) as *A. hypogaea* and with which it is possible to obtain fertile hybrids. Without a doubt, *A. monticola* is linked to the history of the cultivated peanut and it is possible that it has had some participation in the origin of this cultigen.

The material from Lozano (30063) differs somewhat from the type specimen in that the plant and fruits are somewhat smaller. Evidently, it pertains to an isolated population, despite the short distance (6 km) that separates Lozano from Yala.

Both populations also differ in the morphology of chromosome "B," carrier of the satellite. The material from Yala has the "B" pair similar to *A. hypogaea* ssp. *fastigiata*; on the other hand, the Lozano material has a "B" pair similar to that of ssp. *hypogaea* (Fernández & Krapovickas 1994).

Pickett (1955) studied the oils of *A. monticola* (Yala) and of *A. correntina*. The analyses show a great similarity with those generally published for *A. hypogaea*. The oil of *A. correntina* is similar to that of the runner peanuts (ssp. *hypogaea*); on the other hand, the oil of *A. monticola* resembles the "Spanish" types (ssp. *fastigiata*) (Krapovickas & Rigoni 1957: 441).

Obs. 2. *Arachis monticola* produced highly sterile hybrids when crossed with the annual diploid species *A. duranensis* and *A. stenosperma* and with the perennial species *A. Cardenasii* and *A. Diogoi*. In the hybrid obtained with *A. villosa*, 45.7% stained pollen was observed.

46. *Arachis magna* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*

Figs. 3,46; 26,C-D

Herba annua. Caulis angulosus dum juvenis villosus. Stipulae dorso et base villosae setulis longis sparsim immixtis, margine ciliatae. Folia caulis principalis foliolis oblongis vel interdum subovatis, acutis, illa ramorum ovalibus usque obovatis, acutiusculis usque obtusis, epiphyllo glabro, hypophyllo breviter et sparsim adpresso-piloso, nervo medio et margine pilis longis vestito. Hypanthium 5-7.5 cm longum, villosum. Calyx 5-6 mm longus, villosus setulis paucis immixtis. Vexillum 10-14 mm longum x 13-16 mm latum, aurantiacum, raro luteum. Fructus subterraneus, biarticulatus paxillo 3-17 cm longo, isthmo usque ad 5 cm longo, articulis 13-17 mm longis x 7-9 mm latis, apice recurvo, pericarpio reticulato nervis manifestis.

Holotype: BOLIVIA. Santa Cruz. Prov. Velasco, San Ignacio, 60°58'W, 16°22'S, 370 m s.m., en el borde S de la población, plaza del Ex Combatiente, plantas hasta 2.50 m diám., eje central hasta 35 cm alt., ramas procumbentes, 5-V-1977, Krapovickas, Gregory, Schinini & Simpson 30097 (CTES). Isotypes: G, GH, K, LIL, LPB, MO, NY, SP, US.

Annual plant. Mainstem erect, 30-55 cm tall, without flowers; lateral branches procumbent, up to 1.30 m long. Stem angular, villous on the young parts, to subvillous, hairs ca. 1.5 mm long, occasionally bristles present; internodes of the mainstem up to 55 mm long, of the lateral branches 30-90 mm long. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules 14-19 mm long, the free tips 25-37 mm long x 2-4 mm wide at the base; petiole 38-52 mm long, rachis 10-17 mm long; leaflets oblong, occasionally somewhat ovate, acute, the apical pair 53 mm long x 20 mm wide but up to 75 mm x 30 mm (length/width ratio 2.1-2.6:1), the basal pair 46 mm x 16 mm but up to 66 mm x 28 mm (length/width ratio

2.0-2.8:1). On the lateral branches, the fused portion of the stipules 8-9 mm long, the free tips 14-21 mm long x 2-3.5 mm wide at the base; petiole 11-25 mm long; rachis 7-11 mm long; leaflets oval to obovate, slightly acute to obtuse, apical pair 25-45 mm long x 17-25 mm wide (length/width ratio 1.4-1.8:1), basal pair 20-40 mm long x 13-21 mm wide (length/width ratio 1.6-1.9:1). Stipules with the fused portion from more or less villous to subglabrous, with long hairs more dense along the dorsal line and toward the base, there are also long scattered bristles; free portion with surfaces glabrous or with some long hairs and bristles toward the base, margin ciliate. Petiole and rachis canaliculate, villous. Upper surface of the leaflets glabrous, smooth; lower surface midvein and margin somewhat marked, with small, scattered, adpressed hairs and with long hairs along the midvein and on the margin. Flowers along the length of the lateral branches, in very short, 5-7-flowered axillary spikes. Hypanthium 5-7.5 cm long, villous. Calyx bilabiate, villous and with a few long bristles; upper lobe 4-dentate, 5 mm long, lower lobe falcate, 6 mm long. Standard 10-14 mm long x 13-16 mm wide, orange, rarely yellow, wings yellow, 6-8 mm long. Fruit subterranean, biarticulate; peg 3-17 cm long, with long hairs very scattered on the aerial part; isthmus up to 5 cm long; articles usually 13 mm long x 7 mm wide but up to 17 mm x 9 mm, with marked beak, pericarp reticulate with prominent veins. Seed 10-11 mm long x 5-6 mm wide. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BOLIVIA. **Santa Cruz.** Prov. Ñuflo de Chavez: El Carmen, ca. 42 km SSW de Concepción, 62°26'W, 16°38'S, 1-V-1977, Krapovickas & al. 30092 (CTES, US); Embocada del Carmen (ca. 40 km SSW de Concepción), 2-V-1977, Krapovickas & al. 30093 (CEN, CTES, G, GH, K, LPB, MO, NY, P, SI, US).

Geographic distribution. To date, this species has been collected in the northeast of the department of Santa Cruz, Bolivia, to the north of the Chiquitano massif, in an area of savannahs and rolling hills. It grows in deep humus-bearing soils.

Obs. Because of the large size of the plant and the form and size of the leaves and the fruit, *Arachis magna* much resembles *A. monticola* and it is very difficult to distinguish between them. They differ principally by the level of ploidy, *A. magna* is diploid, 2n=20 chromosomes, and *A. monticola* is tetraploid and occurs in NW Argentina. It is possible to differentiate them because in *A. monticola* the back of the leaflets is subglabrous with barely visible diminutive adpressed hairs and long hairs only on the midvein. In contrast, in *A. magna*, while the back of the leaflets has a similar indumentum, there are also some long hairs, ca. 2 mm long, on the rest of the surface.

The young plants of *A. magna* show greater differences, since the cotyledonary branches develop after the first flowers have produced fruits and at this stage the plants resemble species of the sections *Trierectoides* and *Erectoides*.

Arachis magna is very close to *A. ipaënsis*, as much for its growth form as for its fruit. We believe it proper to separate them because *A. ipaënsis* is a less vigorous plant and all of its parts are smaller. The species can be separated by the presence of bristles on the stipules, which is constant in all of the collections of *A. magna* and lacking in *A. ipaënsis*. Furthermore, the latter species occurs in the department of Tarija in southern Bolivia, near Villa Montes, in thickets of *Bromelia serra* Griseb., a typically "chaqueña" species.

47. *Arachis ipaënsis* Krapov. & W.C. Gregory *nov. sp.*

Figs. 3,47; 25

A. ipaensis M.P. Gregory & W.C. Gregory. J. Hered. 70: 192. 1979, *nomen nudum*. Refers to "Parent no. 70" (Krapovickas & al. 19455).

Herba annua. Caules glabrescentes. Stipulae dorso paucis pilis longis vestitae, margine ciliatae, setulis destitutae. Epiphyllum glabrum, hypophyllum nervo medio pilis 1.5 mm longis, ceterum juventute pilis brevioribus adpressis sparsim vestitum, deinde glabrescens, margine non incrassato ciliatum et setulis raris brevibus

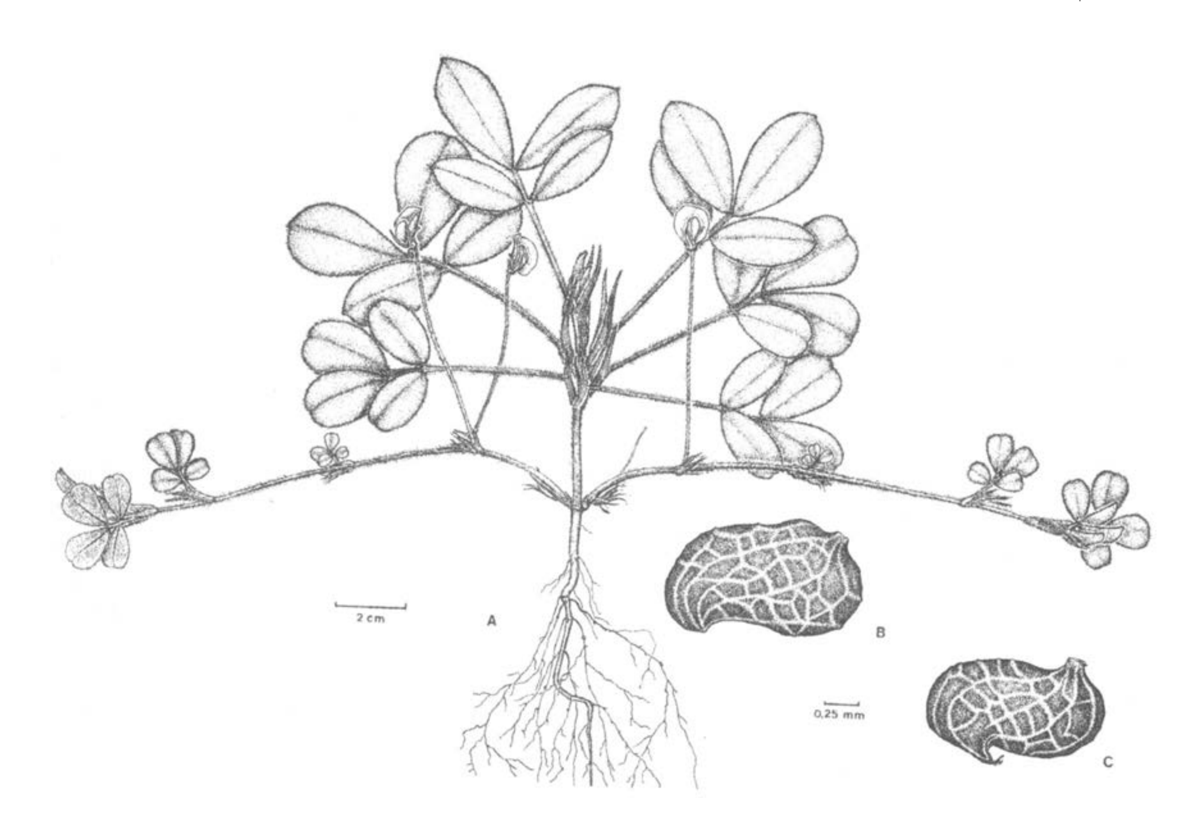


Fig. 25. *Arachis ipaënsis*: A, plant; B, apical article; C, basal article of the fruit (K.19455).

instructum. Hypanthium villosum 5-15 cm longum. Calyx 5-6 mm longus, villosus et setulosus. Vexillum aurantiacum[7], *11-13 mm longum x 14-15 mm latum. Fructus subterraneus, biarticulatus paxillo glabro 5-22 cm longo, isthmo 1-15 mm longo, articulis 14-17 mm longis x 7-10 mm latis, pericarpio reticulato.*

Holotype: BOLIVIA. Tarija. Ipa, Quebrada de Thaiguate (30 km N de Villa Montes) 63°25'W, 21°S, 650 m s.m., 3-VI-1971, Krapovickas, Mroginski & Fernández 19455 (CTES). Isotypes: CEN, G, K, LIL, LPB, MO, NY, P, SI, US.

Taprooted perennial. Mainstem up to 45 cm in length, with few branches at the base. The first two cotylendonary branches begin with numerous clustered inflorescences, that fruit rapidly and later elongate to form procumbent branches ca. 50 cm long. Stems glabrescent, the younger portions partly villous, with more or less erect long hairs ca. 1.5 mm long; internodes of the mainstem up to 75 mm long, internodes of the lateral branches up to 55 mm long. Leaves tetrafoliolate, leaflets from obovate to elliptical. On the mainstem, the fused base of the stipules 7-13 mm long, the free tips 17-20 mm long x 2 mm wide; the petiole usually 45 mm long, varying between 35-53 mm; the rachis 10 mm long; the apical leaflets commonly 38 mm long x 18 mm wide but up to 45 mm x 25 mm, the basal leaflets somewhat smaller, ca. 33 mm long x 15 mm wide but up to 42 mm x 20 mm. Leaves on the lateral branches with the fused portion of the stipules 3-5 mm long, the free portion 9-10 mm long x 2 mm wide. The petioles usually 20 mm long (up to 32 mm); rachis 7-10 mm long. The apical pair of leaflets ca. 23 mm long x 18 mm wide (up to 28 mm x 18 mm), the basal pair some 20 mm long x 14 mm wide (up to 27 mm x 16 mm). Stipules slightly imbricated at the base, surfaces glabrous, except for some long hairs on the back of the fused portion and cilia along the margin. Petiole, rachis and pulvinus with some long scattered hairs. Leaflets

[7]Error in original, appeared as *luteum* (yellow).

glabrous above and glabrescent below, when young with very short, sparse, adpressed hairs, midvein with some long hairs (1.5 mm long), margin not thickened, somewhat wavy when dry, ciliate, rarely with an occasional short bristle. Flowers occur along the length of the lateral branches and are also clustered at the base of the plant. Hypanthium villous, 5-15 cm long, the longest ones near the base of the plant. Calyx bilabiate, the wider lobe 5-6 mm long, the narrower lobe falcate, 6-7 mm long. Corolla orange (see footnote[7]), standard 11-13 mm long x 14-15 mm wide, wings 6-8 mm long. Fruit biarticulate; pegs glabrous, 5-22 cm long, superficial; isthmus 1-15 mm long; articles 14 mm long x 7 mm wide but up to 17 mm x 10 mm, epicarp reticulate, with more or less prominent veins. 2n=20 chromosomes (M.P. Gregory & W.C. Gregory, 1979).

Additional material: From the same location as the holotype: 12-IV-1977, Krapovickas & al. 30076 (CTES, NY, US).

Geographic distribution. This species has been found, up until now, only in the type locality, where it grows on the upper parts of stream ravines, among bromeliads.

Obs. *Arachis ipaënsis* formed hybrids only with annual diploid species of section *Arachis*, such as *A. duranensis* and *A. Batizocoi* and with *A. hypogaea* var. *hypogaea*, producing in all cases very sterile hybrids with less than 3.7% pollen staining. These results show that *A. ipaënsis*, which lives near the edge of the ranges of *A. duranensis* and of *A. Batizocoi*, is an entity that has developed some very effective genetic isolation mechanisms, comparable to those that separate *A. duranensis* from *A. Batizocoi*.

Morphologically, *A. ipaënsis* is very similar to *A. magna*. The latter species occurs in the extreme NE of the department of Santa Cruz in Bolivia.

48. *Arachis valida* Krapov. & W.C. Gregory *nov. sp.*

Figs. 3,48; 26,A-B

Herba annua. Stipulae glabrae aut medio serie pilorum, dorso pilis longis instructae, margine ciliatae. Folia caulis principalis foliolis oblongis, acutis illa ramorum foliolis oblongis, epiphyllo laevi, glabro, hypophyllo nervo medio prominente, nervis secundariis manifestis, praeter pilos ca. 2 mm longos in nervo medio glabro, margine vix conspicuo breviter ciliato. Hypanthium 7-10.5 cm longum, villosum. Calyx 7-8 mm longus, villosus. Vexillum ca. 15 mm longum, aurantiacum. Fructus biarticulatus paxillo ca. 12 cm longo, isthmo ca. 6 mm longo, articulis 12-17 mm longis x 8-10 mm latis, apice recurvo, pericarpio valde reticulato.

Holotype: BRAZIL. Mato Grosso do Sul. 35 km SE of Corumbá. Fazenda Vale do Paraiso on road to Porto Manga, and then 6 km N toward Baía Negra and Banda Alta, 19°11'S, 57°29'W, 80 m, in a palm glade of carandai (*Copernicia* sp.), in dark low soil weathered from limestone and probably inundated in times of high water, 10-XII-1976. Krapovickas & Gregory 30011 (CEN). Isotypes: CTES, G, GH, K, MO, NY, P, RB, SI, SP, US.

Annual plant, very vigorous. Mainstem 5-60 cm tall, without flowers, much branched; lateral branches procumbent, up to 1.5 m long, branched; internodes 3-6.5 cm long, more or less villous. Leaves tetrafoliolate. On the mainstem, stipules with fused portion 13-17 mm long, the free ends 32-34 mm long x 2-3 mm wide at the base; petiole 38-55 mm long; rachis 10-15 mm long; leaflets oblong, acute, the apical pair 50 mm long x 18 mm wide, up to 75 x 24 mm (length/width ratio 2.7-3.1:1), the basal pair ca. 42 mm long x 16 mm wide, up to 63 x 18 mm (length/width ratio 2.6-3.5:1). On the lateral branches, the fused portion of the stipules 7-8 mm long, the free tips 16-19 mm long x 3-5 mm wide at the base; petiole 8-31 mm long; rachis 6-10 mm long; leaflets eliptical, apical pair ca. 24 mm long x 13 mm wide, up to 51 x 26 mm (length/width ratio 1.8-2.25:1), basal pair 21 mm long x 10 mm wide, up to 42 x 18 mm (length/width ratio 1.9-2.3:1). Stipules with long hairs on the back of the fused portion, surfaces glabrous or with a line of hairs along the center of the free parts, margin ciliate. Petiole and rachis canaliculate, with the back villous and the canal glabrous. Pulvinus villous. Leaflets with the upper surface smooth and glabrous, the lower

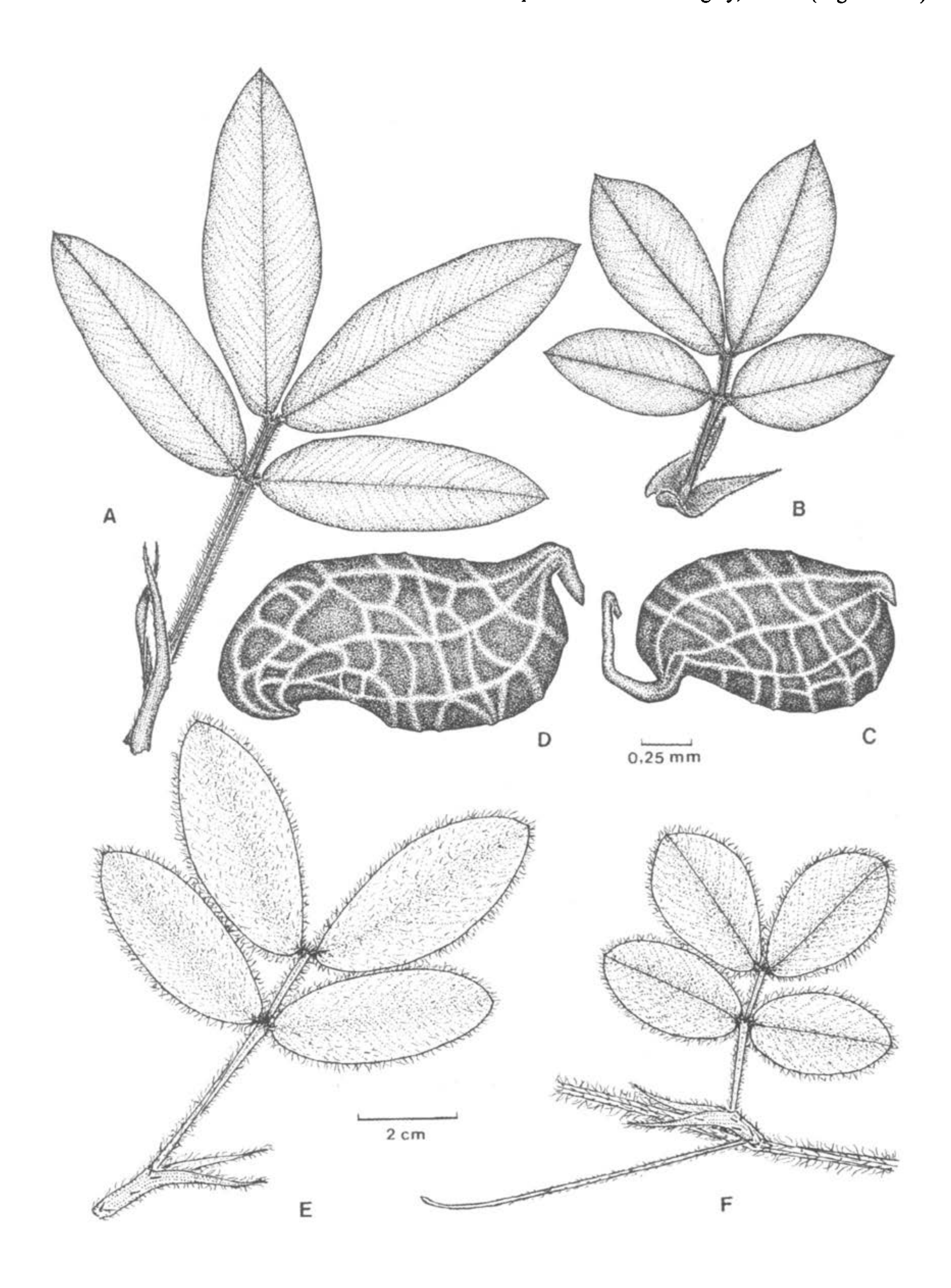


Fig. 26. *Arachis valida*: A, leaf from mainstem; B, leaf from lateral branch (K.30011). *A. magna*: C, basal article; D, apical article of the fruit (K.30093). *A. Hoehnei*: E, leaf from mainstem; F, leaf from lateral branch (Sc.21450).

surface with prominent midvein and marked secondary veins, glabrous except for some long hairs along the midvein; margin somewhat marked on the underside and shortly ciliate. Flowers along the length of the lateral branches, in axillary spikes up to 10 mm long, 3-5-flowered; bracts ciliate on the margin. Hypanthium 7-10.5 cm long, villous. Calyx bilabiate, villous and with dispersed bristles, upper lobe 4-toothed, 7 mm long, lower lobe falcate, 8 mm long. Standard orange, ca. 15 mm long; wings yellow, ca. 7 mm long. Fruit biarticulate; peg ca. 12 cm long, somewhat villous toward the base; isthmus ca. 6 mm long; articles 12-17 mm long x 8-10 mm wide, the apical article somewhat larger than the basal, covered by a thin coat of diminutive hairs; pericarp strongly reticulate, with a pronounced beak. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BRAZIL. **Mato Grosso do Sul.** From the type locality: 1-VII-1977, Krapovickas & al. 30147 (CEN, CTES, NY, US); 12-X-1985, Valls & al. 9153 (CEN, CTES); id., Valls & al. 9157 (CEN, CTES); id., Valls & al. 9162 (CEN).

Geographic distribution. This species is known only from the type locality, where it grows in inundated grasslands with palms of the genus *Copernicia*.

49. *Arachis Williamsii* Krapov. & W.C. Gregory *nov. sp.*

Fig. 3,49

Herba annua. Radix palaris. Caulis pilis 1.5-2 mm longis villosus, principalis erectus ca. 10 cm longus, rami procumbentes. Stipulae basi villosae et setulis large instructae. Folia caulis principalis foliolis oblongis, illa ramorum foliolis distalibus obovatis, proximalibus oblongis. Epiphyllum laeve, glabrum, hypophyllum margine et nervis paulo manifestis, pilis parvis perdense adpressis, nervio medio et margine majoribus (1 mm longis) vestitum. Hypanthium 30-75 mm longum, villosum. Calyx 5-7 mm longus, villosus, margine setulosus. Vexillum aurantiacum, 12 mm longum. Fructus subterraneus, biarticulatus paxillo 10-15 cm longo, subglabro, articulis 11 mm longis x 6.5 mm latis, apice recurvo, pericarpio notabiliter reticulato.

Holotype: BOLIVIA. Dep. Beni. Trinidad, Universidad Técnica del Beni, 15 m E del edificio laboratorios; fruto reticulado, 21-III-1990. Williams & Claure 1118 (CTES).

Annual plant. Mainstem erect, ca. 10 cm tall, lateral branches procumbent, 35 cm long; stem quadrangular, villous, hairs 1.5-2 mm long. Leaves tetrafoliolate, stipules villous towards the base and with bristles over almost the entire surface, petiole and rachis villous, upper leaf surface smooth, glabrous, underside with margin and veins slightly marked, small very adpressed hairs and long hairs (1 mm long) on the midvein and margin, where there are also a few short bristles. On the mainstem, stipules with the fused portion 10-12 mm long and the free portion 15-20 mm long x 2.5-4 mm wide, petiole 30-35 mm long, rachis 10 mm long, leaflets oblong, the distal ones 32-34 mm long x 16-18 mm wide, the proximal ones 28-38 mm long x 12-16 mm wide. On the lateral branches, stipules with the fused portion 8-11 mm long, free portion ca. 16 mm long x 3 mm wide, petiole 12-20 mm long, rachis 6-10 mm long, distal leaflets obovate, 23-35 mm long x 15-21 mm wide, proximal leaflets oblong, 21-29 mm long x 13-16 mm wide. Hypanthium 30-75 mm long, villous. Calyx villous, with bristles on the margin, upper lobe 5 mm long, lower lobe falcate, 7 mm long. Standard 12 mm long, orange. Fruit subterranean, biarticulate; peg 10-15 cm long, glabrous or with some short hairs on the exposed parts, articles 11 mm long x 6.4 mm wide, strongly reticulate, with beak.

Additional material: BOLIVIA. **Beni.** Prov. Cercado, Trinidad, Campus of the Universidad Técnica del Beni, 155 m, 14°48'S, 64°52'W, in recently cultivated maize field 400 m SE of University building. Soil dark grey sandy clay, 25-XI-1988, Williams 867 (CTES); id., 500 m al SE del edificio laboratorios, 22-III-1990, Williams 1120 (CTES).

Cultivated material: ARGENTINA. **Córdoba.** Manfredi, E.E.A. (INTA). Cult. 66, origin: Williams 1118, 21-III-1991, Krapovickas 43797 (CTES); id., 43798 (CTES); id., 27-III-1992, Krapovickas 44092 (CTES).

Geographic distribution. This species is known only from the type locality: Trinidad,

department of Beni (Bolivia).

We dedicate this species to Dr. David Edison Williams who recently discovered it and is the author of the doctoral thesis "Peanuts and Peanut Farmers of the Río Beni: Traditional Crop Genetic Resource Management in the Bolivian Amazon."

Common name. "manicillo" (Williams 867).

50. *Arachis Batizocoi* Krapov. & W.C. Gregory

Fig. 3,50

Krapovickas & Gregory, Bonplandia 3(11): 129, 1974.

A. Batizocae Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 96, 1973, *nomen nudem*.

Perennial or biennial herb. Taproot, deep but frail. Mainstem 0.30-1 m long, erect when young, then recumbent, little branched, with flowers toward the apex. Lateral branches (n+1) usually only 4, procumbent, little or no branching, up to 4 m long. Stems angular, villous, especially on the young parts; internodes 4-10 cm long. Leaves tetrafoliolate, those of the mainstem notably larger than those of the lateral branches. On the mainstem, the fused portion of the stipules up to 12 mm long, the free portion up to 21 mm long; petiole up to 70 mm long; rachis up to 22 mm long; apical pair of leaflets oval, usually 50 mm long x 35 mm wide (up to 60 mm x 43 mm), basal pair oblong, 40 mm long x 23 mm wide (up to 59 mm x 33 mm). On the lateral branches, the fused portion of the stipules up to 8 mm long, the free portion up to 12 mm long x 5 mm wide at the base; petiole 15-35 mm long; rachis 10-15 mm long; apical pair of leaflets from suborbicular to obovate, usually 27 mm long x 25 mm wide (up to 35 mm x 32 mm), basal pair oval, 26 mm long x 20 mm wide (up to 31 mm x 26 mm). Stipules pilose toward the base and on the back of the fused portion, with scattered bristles, more abundant near the union with the petiole, margin ciliate. Petiole and rachis canaliculate, with long scattered hairs and some bristles. Upper surface of the leaflets glabrous, smooth, and the lower surface with veins and margin little marked, with hairs 1.5-2 mm long, scattered over the whole surface, margin longly ciliate and with some short bristles. Spikes axillary, 5-flowered, with axis ca. 5 mm long. Hypanthium villous, 5 cm long (2.5-8 cm). Calyx bilabiate, with some long silky hairs and with bristles, upper lobe 4-7 mm long, lower lobe falcate, 5-7.5 mm long. Standard 10-12 mm long x 10-14 mm wide, light yellow with tenuous radial, reddish lines, more pronounced on the dorsal surface and the spaces between the lines with violet tinge; wings yellow, 7-8 mm long. Fruit biarticulate; peg 5-12 cm long, villous on the aerial portion; isthmus 0.5-4 cm long; articles 10-15 mm long x 7-10 mm wide, with pronounced beak, pericarp smooth or lightly reticulate. Seed 8-12 mm long x 5-6 mm wide. 2n=20 chromosomes (Krapovickas, Fernández & Seeligmann 1974).

Holotype: BOLIVIA. Santa Cruz. Prov. Cordillera, Parapetí, en suelo de arena, cerca de la estación del ferrocarril Santa Cruz-Yacuiba. 24-II-1958, Krapovickas 9505 (LIL). Isotypes: CTES, F, G, MICH, MO, SI.

Additional material: BOLIVIA. **Chuquisaca.** L. Clavo, El Salvador-CIMBOC, 20°34'S, 63°8'W, 7-IV-1993, Saravia Toledo & al. 11442. **Santa Cruz.** Cordillera, Parapetí, 24-II-1958, Krapovickas 9484 (CTES, LIL), 9495 (CTES, LIL), 9496 (LIL), 9497 (LIL), 9498 (LIL), 9503 (LIL), 9504 (LIL); Paja Colorada, 28 km S de Camiri, 14-IV-1977, Krapovickas & al. 30079 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, US); Ipati (37 km N de Camiri), 16-IV-1977, Krapovickas & al. 30080 (CEN, CTES, G, GH, LIL, LPB, MO, NY, US); 5 km S de Lagunillas, 16-IV-1977, Krapovickas & al. 30081 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, US); 3 km N de Ipati, 17-IV-1977, Krapovickas & al. 30082 (CEN, CTES, G, GH, K, LPB, MO, NY, US); 22 km N de Gutierrez, 17-IV-1977, Krapovickas & al., 30083 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, US); Lagunillas, 1000 m, II-1951, Cárdenas 4741 (LIL, US).

PARAGUAY. **Boquerón** (ex Nueva Asunción). Ruta Trans-Chaco, 25 km S de Nueva Asunción, 20°50'S, 61°55'W, 12-XII-1987, Schinini & al. 25658 (CTES); Ruta Trans-Chaco, 20°40'S, 62° W, 12-XII-1987, Schinini & al. 25704 (CTES).

Geographic distribution. This species was collected in the SW of the department of Santa Cruz (Bolivia) at altitudes varying between 700 and 1000 meters above sea level, in open places with a soil of almost pure sand, or on low sandy hills. The southern limit of its range is found in El Salvador, near Carandayti, in the department of Chuquisaca. It was also collected in the vicinity of Nueva Asunción, in the Paraguayan "chaco," near the Bolivian border.

Obs. Within section *Arachis*, *A. Batizocoi* crosses with the annual species *A. duranensis, A. ipaënsis* and *A. stenosperma* and with the perennial species *A. Cardenasii, A. correntina, A. Diogoi* and *A. villosa*, producing, in all cases, highly sterile hybrids.

With species from the other sections, *A. Batizocoi* has only crossed with the tetraploid rhizomatous species, *A. pseudovillosa* and *A. glabrata* var. *glabrata*, producing hybrids that never flowered or are highly sterile.

Smartt, Gregory & Gregory (1978a,b) proposed the B genome for *A. Batizocoi*, as opposed to the A genome found in at least 9 other species in section *Arachis*, due to the low genetic compatibility of *A. Batizocoi* as demonstrated by the production of highly sterile hybrids.

51. *Arachis duranensis* Krapov. & W.C. Gregory *nov. sp.*

Fig. 3,51

A. argentinensis Speg. Hoehne. Genero *Arachis.* Flora Brasílica 25(2) part. 122: 7 & 14, 1940, *nomen nudum in syn. sub. A. villosa*. (USNA 16177, Argentina, Salta, Spegazzini)

A. duranensis Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 96, 1973, *nomen nudum*. This refers to the specimen Krapovickas 7988.

A. Spegazzinii M.P. Gregory & W.C. Gregory. J. Hered. 70: 192. 1979, *nomen nudum*. "Parent no. 8" (Gregory & al. 10038).

Herba annua. Stipulae subglabrae, dorso pilis longis vestitae, margine ciliatae, setulis destitutae. Folia caulis principalis foliolis ovali-oblongis, illa ramorum foliolis rotundatis, epiphyllo glabro, hypophyllo pilis ca. 2 mm longis, sericeis sparsim, in nervo medio densius vestito, margine vix manifesto pilis longis sparsim instructae. Hypanthium 3-6 cm longum, pilosum. Calyx 7 mm longus, pilis longis sericeis setulisque vestitus. Vexillum suborbiculare, 10 mm longum x 9 mm latum, aurantiacum, raro luteum. Fructus biarticulatus paxillo 3.5-14 cm longo, glabro, isthmo 4-11 cm longo, articulis 10.5-15.5 mm longis x 5-8 mm latis, tenuiter reticulato paene laevi.

Holotype: ARGENTINA. Córdoba. Manfredi, cult. de semillas procedentes de Campo Durán, prov. Salta, Argentina (Krapovickas 29-V-1953), III-1954, Krapovickas 8010 (CTES). Isotypes: BAB, CEN, F, G, GH, K, LIL, MO, NY, P, SI, UC, US.

Annual plant. Taproot tetrarchial. Mainstem erect, 20-30 cm tall, with numerous vegetative branches growing from the lower half and with flowers toward the apex; internodes up to 1.5 cm long. Lateral branches procumbent, up to 1.40 m long, the basal ones horizontal, those originating higher up on the mainstem bending toward the soil describing a reclining elongated S; along the cotyledonary branches, two vegetative and two reproductive axes alternate more or less regularly, on the remaining branches there is a predominance of reproductive branches; stems green but with a violet tinge on the parts exposed to the sun; internodes usually 3 cm long, ranging from 1.5 up to 4 cm long, villous on the young parts. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules 8 mm long x 4 mm wide, the free tips 14-18 mm long x 2-3 mm wide, acute; petiole 23-36 mm long; rachis 8-13 mm long; apical leaflets usually 30 mm long x 22 mm wide (up to 36 mm x 24 mm), basal leaflets 26 mm long x 18 mm wide (up to 32 mm x 21 mm). On leaves of the lateral branches, the fused portion of the stipules 4-5 mm long x ca. 3 mm wide, the free part 7-11 mm long x 2 mm wide; petiole 7-11 mm long; rachis ca. 4 mm long; apical pair of leaflets usually 14 mm long x 13 mm wide (up to 17 mm x 16 mm), basal pair of leaflets 12 mm long x 10 mm wide (up to 15 mm x 13 mm). Stipules

with surfaces subglabrous to lightly pubescent, with long hairs on the back of the fused portion and ciliate margin, without bristles. Petiole somewhat canaliculate, with long hairs on the back and pubescent in the canal. Leaflets of the mainstem oval-oblong, those of the lateral branches rounded, occasionally weakly retuse, mucronulate; upper surface glabrous, lower surface with long, scattered, silky hairs, ca. 2 mm long, more abundant on the midvein, margin slightly marked, with sparse long hairs. Axillary spikes up to 5-flowered, axis up to 1 cm long. Hypanthium 3-6 cm long, pilose. Calyx bilabiate, covered with long silky hairs and with bristles; upper lobe 7 mm long. Standard suborbicular, yellow, bordered with orange or yellow, 10 mm long x 9 mm wide, upper surface striated with radial red lines; wings 7 mm long x 3.5 mm wide, yellow; keel falcate, 8 mm long, yellowish white. Fruit biarticulate, peg 3.5-14 cm long, almost vertical; isthmus 7 (4-11) cm long, glabrous, violet on the aerial part, pilose on the subterranean part near the soil surface; articles cylindrical, flattened at the apex and with beak, 13 (± 2.5) mm long x 6.5 (± 1.5) mm wide; pericarp weakly reticulate; epicarp densely covered with thin hairs that strongly retain a layer of soil. Seed 10.5 (± 2) mm long x 5 (± 1) mm wide. 2n=20 chromosomes (Krapovickas & Rigoni 1957: 438, *sub. A. pusilla*, Smartt & Gregory 1967, GKP 10038).

Additional material: ARGENTINA. **Jujuy.** Dep. Capital: 2 km S de Palpalá, flor anaranjada, 29-III-1977, Krapovickas & al. 30061-A (CTES, GH, MO, NY, US); id., flor amarilla, Krapovickas & al. 30061-B (CTES, GH, MO, NY, SI, US); id., población, Krapovickas & al. 30061 (CEN, CTES, F, G, GH, K, LIL, MO, NY, P, SI, SP, UC, US); id., 8-IV-1980, Krapovickas & al. 36004 (CEN, CTES, G, GH, LIL, MO, NY, RB, SI, US); 8,6 km SE de S.S. de Jujuy, ruta 66, 14-III-1982, Schinini & al. 21767 (CEN, CTES, G, GH, K, LIL, MO, NY, SI, SP, US). Dep. El Carmen: Perico, 17-I-1906, Spegazzini (BAB 15508); Perico, 1 km N de río Perico, 28-III-1977, Krapovickas & al. 30060 (CTES, G, GH, LIL, MO, NY, SI, US); Perico, aeropuerto El Cadillal, 31-III-1977, Krapovickas & al. 30064 (CEN, CTES, GH, K, LIL, MO, NY, US); río Perico, aeropuerto El Cadillal, 12-III-1982, Schinini & al. 21766 (CEN, CTES, G, GH, LIL, MO, NY, US). Dep. Ledesma: ruta 34, 4 km S de Fraile Pintado, 9-XII-1970, Schinini & al. 19539 (CTES); id., 9-V-1983, Krapovickas & al. 38905 (CTES). **Salta.** Dep. Capital: Salta, 7-III-1905, Spegazzini (BAB 13765); Río Arias, Camping Municipal, 4-V-1980, Krapovickas & al. 36036 (CEN, CTES, G, GH, K, LIL, MO, NY, P, SI, SP, US); Sporting Club, 10-III-1982, Schinini & al. 21763 (BAB, CTES, F, G, LIL, MO, NY, P, SI, UC, US); San Luís, 11-I-1949, Filipovich 404 (LIL); El Prado, 5-II-1949, Legname 946 (LIL); El Prado, río Arenales, 7-V-1959, Gregory & al. 10038 (CTES, GH, LIL, MO, NY, SI, SP, US); San Luís, río Arenales, 10-V-1975, Krapovickas & al. 28458 (C, CTES, LIL, UC, US); San Luís, 11-III-1982, Schinini & al. 21764 (CEN, CTES, GH, K, MEXU, MO, NY, SI, US); La Loma, 21-III-1979, Fernández 613 (CTES); La Loma, Grand Bourg, 10-IV-1980, Krapovickas & al. 36006 (CEN, CTES, G, GH, LIL, MO, NY, SP, US); Aeropuerto de Salta, 9-IV-1980, Krapovickas & al. 36005 (CEN, CTES, G, GH, K, LIL, MO, NY, RB, UC, US). Dep. La Caldera: estancia La Despensa, 16-IV-1943, Hunziker 1635 (CORD, LIL, SI). Dep. Metán: 14 km WNW de El Tunal, río Juramento, flor amarilla, 4-IV-1980, Krapovickas & al. 36002 (CEN, CTES, G, GH, K, LIL, MO, NY, SI, SP, US); id., flor anaranjada, Krapovickas & al. 36003 (CEN, CTES, G, GH, K, LIL, MO, NY, SI, SP, US). Dep. Anta: La Lagunita (Coronel Olleros), 9-III-1958, Morello & al. 356 (CTES, LIL); Palermo, Río del Valle, 64°14'W, 24°41'S, 23-III-1980, Vorano s/n (CTES, MCNS, US); 5 km N de Palermo, 21-III-1982, Schinini & al. 21772 (CTES, MO, NY); río del Valle, 5 km N de Las Lajitas, 24-IV-1983, Krapovickas & al. 38900 (CTES); 1 km S de Anta, 21-III-1982, Schinini & al. 21770 (CTES, G, GH, LIL, MO, NY, SI, US); id., 11-V-1983, Krapovickas & al. 38906 (CTES); Anta, 24°55'S, 64°25'W, 21-III-1982, Schinini & al. 21771 (CTES, LIL, MO, US). Dep. Chicoana: Los Los, Filipovich 415 (LIL). Dep. Gral. José de San Martín: Piquirenda, Quebrada Yacuí, 3-II-1925, Schreiter 3841 (LIL); id., Schreiter 4107 (LIL); Campo Durán, 22-I-1930, Horovitz (SI); id., Parodi 9189 (SI); id., 29-V-1953, Krapovickas 7988 (CTES, G, LIL, SI, US); id., Krapovickas 7993 (CTES, SI); id., 6-VI-1972, Krapovickas & al. 19490 (CTES, G, MO, NY, UC, US); id., 8-V-1983, Krapovickas & al. 38903 (CTES); 3 km E de Senda Hachada, río Seco, 2-IV-1977, Krapovickas & al. 30065 (CEN, CTES, F, G, GH, K, MO, NY, P, SP, UC, US); 5 km W de Dragones, 2-IV-1977, Krapovickas & al. 30066 (CEN, CTES, G, GH, K, LIL, MO, NY, P, RB, SI, UC, US); id., 9-V-1983, Krapovickas & al.

38904 (CTES); Dragones, 12-III-1992, Saravia Toledo & al. 10766 (CTES); Senda Hachada, río Seco, 4-IV-1977, Krapovickas & al. 30067 (CTES, G, GH, LIL, K, MO, NY, SI, SP, US); 16 km W de Gral. Ballivián, en arroyo afluente del río Seco, 4-IV-1977, Krapovickas & al. 30068 (CEN, CTES, G, GH, K, LIL, MO, NY, P, SI, UC, US).

BOLIVIA. **Tarija.** Prov. Gran Chaco: Tatarenda, 25-III-1902, Fries 1465 (G); 18 km N de Yacuiba, camino a Villa Montes, ayo. Coloradito del Palmar (quebrada de Tatarenda), 7-IV-1977, Krapovickas & al. 30070 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, US); 30 km N de Yacuiba, Campo de La Tapia, Caiza, 600 m, 7-IV-1977, Krapovickas & al. 30069 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, UC, US); 2 km W de Saladillo, río Caraparí, 1000 m, 8-IV-1977, Krapovickas & al. 30071 (CTES, G, GH, LIL, LPB, MO, NY, US); 14 km N de Caraparí, 870 m, 8-IV-1977, Krapovickas & al. 30072 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, US); 32 km N de Yacuiba, 540 m, 10-IV-1977, Krapovickas & al. 30073 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, SP, US); 2 km N de Palmar Grande (38 km S de Villa Montes), 400 m, 10-IV-1977, Krapovickas & al. 30074 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, SP, US); Villa Montes, XI-1910, Herzog 1110 (G); Simbolar del Carmen, 20 km E de Villa Montes, 28-V-1971, Krapovickas & al. 19408 (CTES, LPB, US); id., 2-IV-1971, Krapovickas & al. 19435 (CEN, CTES, G, LIL, LPB, MO, NY, SI, US); 5 km S de Villa Montes, camino a Yacuiba, 450 m, 10-IV-1977, Krapovickas & al. 30075 (CEN, CTES, G, GH, LIL, LPB, MO, NY, P, SI, US); 7 km N de Villa Montes, 6-V-1983, Krapovickas & al. 38901 (CTES); 18 km S de Villa Montes, 7-V-1983, Krapovickas & al. 38902 (CTES); 3 km S de Villa Montes, 11-XII-1990, Saravia Toledo 2738 (CTES). **Chuquisaca.** Prov. Acero: Carandayti, III-1935, Rojas 7387 (G, LIL, SI); Estación Experimental Zootécnica "El Salvador," 27 km W de Carandayti, 500 m, 13-IV-1977, Krapovickas & al. 30077 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, P, SI, US); El Salvador, 6-VI-1991, Saravia Toledo 2989 (CTES); 7 km W de Carandayti, 500 m, 13-IV-1977, Krapovickas & al. 30078 (CTES, MO, NY, US).

PARAGUAY. **Alto Paraguay** (ex Chaco). Mayor Pedro Lagerenza, 60°45'W, 20°5'S, 16-IV-1978, Schinini & al. 15101 (CTES, G, SI, US).

Geographic distribution. *Arachis duranensis* is a species associated with the watershed of the Río de la Plata, at the foothills of the Andes. Its range is tied to the rivers Pilcomayo, Bermejo (with its tributary Grande or San Francisco) and Pasaje or Juramento (with its tributaries Arenales and Arias). The species grows on a strip of land at the base of the first foothills of the Andes, from the department of Chuquisaca (Bolivia) to the province of Salta (Argentina), between 250 m (Dragones, Salta, Argentina) and 660 m (Caraparí, Tarija, Bolivia). Along the San Francisco River, passing through Fraile Pintado, its range reaches as far as Palpalá (Jujuy province) at 1100 m altitude and extends along the rivers Arias and Arenales as far as the area surrounding the city of Salta (El Prado, 1250 m s.m.). It grows in deep, sandy soils, in the vicinity of watercourses.

Obs. 1. Prior to 1977, we had only two live accessions, one from the Arenales River (parent no. 8, GKP 10038) at 1250 m elevation and 10 km to the W of the city of Salta, with yellow flowers, and the other from Campo Duran (parent no. 39, K 7988) at 500 m elevation and ca. 400 km to the NE of the city of Salta, with orange flowers. As these accessions had somewhat different behaviors, we regarded them as independent species: the first *A. Spegazzinii* and the second *A. duranensis*. The hybrids obtained between these two populations produced between 31.3 and 36.7% pollen staining. Nevertheless, the behavior of the two parents (8 and 39) in crosses with other wild species was very similar.

Beginning in 1977, with the intensification of the explorations and thanks to the collaboration of Ing. Agr. Alfredo Vorano of the Estación Experimental Agropecuaria (INTA) of Salta, the collections of wild peanuts from Jujuy and Salta were increased considerably, allowing us to cover the range between those old populations with new accessions. The color of the flowers did not turn out to be significant, given that populations were encountered with both kinds of flowers, both in the city of Salta as well as further to the east. In Palpalá (Jujuy province), the yellow flower was associated with green stems and the orange flower with somewhat purple stems. Nevertheless, in El Tunal (Salta province), where specimens with yellow flowers (K 36002) and orange flowers

(K 36003) grow together, this association does not exist.

With the increase in collections, it was no longer feasible to differentiate the two initial populations, so we decided to consider all of the diploid annual material from NW Argentina as pertaining to a single species, characterized by the presence of long hairs (ca. 2 mm long) on the underside of the leaves, stipules without bristles, and fruits with a smooth pericarp.

Obs. 2. Both the morphology of the chromosomes (Fernández & Krapovickas 1994) and the electrophoretic analysis of seed proteins (Bianchi-Hall & al. 1993) show great variability that is not associated with exomorphological characters nor with geographic distribution.

Obs. 3. In the extreme NW of the Paraguayan "chaco," on the banks of the Timane River, a temporary stream, at the locality of Mayor Pedro Lagerenza (60°45'W, 20°5'S), grow two materials that were collected by Schinini and Bordas in 1978. One resembles *A. Cardenasii* (15219 B), but is an annual, and the other resembles *A. duranensis* (15101 and 15219 A), but with some differences such as, for example, the very villous peg. From seeds taken from no. 15101, we obtained parents 250 with yellow flowers, *aff. A. duranensis*, and 251 with orange flowers, *aff. A. Cardenasii*. This locality is very interesting and deserves to be explored again to resolve the taxonomic position of these two materials.

Obs. 4. In section *Arachis*, *A. duranensis* produces highly sterile hybrids with the annual species *A. Batizocoi* and *A. ipaënsis*, and with 21.2% pollen staining with *A. stenosperma*. When crossing it with perennial species such as *A. Cardenasii*, *A. correntina*, *A. Diogoi* and *A. villosa*, the percentage of stained pollen increases noticeably, reaching as much as 71.2% in the hybrid with *A. Cardenasii*.

With representatives of other sections, it produced highly sterile hybrids with *A. gracilis* and *A. Hermannii*, of section *Erectoides*, and hybrids that never flowered with the rhizomatous tetraploids *A. glabrata* var. *glabrata* and *A. pseudovillosa*.

It is remarkable the ease with which *A. duranensis* crosses with other species, especially when taking into account its marginal position at the extreme western edge of the overall range of the genus *Arachis*.

52. *Arachis Hoehnei* Krapov. & W.C. Gregory *nov. sp.*

Figs. 3,52; 26,E-F

Herba annua. Stipulae dorso subvillosae setulis sparsim immixtis, margine ciliatae. Folia caulis principalis foliolis lanceolatis, illa ramorum foliolis obovatis, apiculatis, supra subtusque pilis ca. 2 mm longis sparsim vestitis, subtus quam supra densioribus, margine longe ciliatis setulisque nonnullis instructis. Hypanthium 4-10 cm longum, villosum. Calyx 7-8 mm longus, setulis lutescentibus immixtis villosus. Vexillum aurantiacum, 15 mm longum x 17 mm latum. Fructus biarticulatus paxillo basi subvilloso 4-10 cm longo, isthmo ca. 2 cm longo, articulis 10-12 mm longis x 6-8 mm latis, pericarpio laevi.

Holotype: BRAZIL. Mato Grosso do Sul. Mun. Corumbá, Baia Vermelha, Fazenda Santa Teresa, 57°28'W, 18°15'S, 6-XII-1976, Krapovickas and Gregory 30006 (CEN). Isotypes: CTES, G, GH, K, LIL, MO, NY, RB, SI, SP, US.

Perennial plant. Taproot without enlargements. Mainstem 10 cm long without inflorescences, the stem completely covered by the stipules; lateral branches procumbent, spreading, ca. 1 m long, with flowers along their length; internodes 30-40 mm long with two kinds of hairs: small whitish, more or less adpressed, others long, yellowish, ca. 2 mm long, and some yellowish bristles. Leaves tetrafoliolate. On the mainstem, the fused base of the stipules ca. 12 mm long x 2 mm wide, the free tips 17 mm long x 1.5 mm wide; petiole 45 mm long; rachis 12 mm long; the apical leaflets 45-55 mm long x 13-15 mm wide and the basal leaflets 41 mm long x 11 mm wide. Leaves of the lateral branches with the fused portion of the stipules 5-6 mm long x 3.5 mm wide, the free portion 12-14 mm long x 2.5-3 mm wide; petioles 10-14 mm long; rachis 7 mm long; the apical pair of leaflets 26-28 mm long x

13-15 mm wide, the basal leaflets 21-23 mm long x 11-12 mm wide. Stipules puberulent, with abundant bristles on the fused basal portion and with some bristles on the free portion, margin longly ciliate. Petiole with two kinds of hairs, similar to those of the stem: some small and whitish, others long and yellowish, and some yellowish bristles. Leaflets of the mainstem narrowly elliptical (length/width ratio 3:1); leaflets of the lateral branches elliptical (length/width ratio 1.8:1); upper leaf surface glabrous, young leaves usually have sparse hairs 2 mm long; lower leaf surface with scattered, more or less erect hairs 1.5 mm long, and diminutive hairs, adpressed and visible, more numerous yet still allowing the epidermis to be seen; midvein with long hairs somewhat more dense than on the rest of the lower surface; margin not thickened, with long scattered cilia and with some short bristles. Inflorescences 4-5-flowered, axis short, covered by the stipules, bracts rigid, longly ciliate. Hypanthium 4-10 cm long. Calyx bilabiate, the wider lobe 6-7 mm long, tridentate, with apical incisions of 0.5 mm, the narrower lobe 7-8 mm long, subfalcate with silky whitish hairs and numerous, somewhat longer yellowish bristles, ca. 1 mm long. Standard orange, 15 mm long x 17 mm wide; wings yellow, 10 mm long x 7 mm wide. Fruit biarticulate; peg 4-10 cm long, wine-colored and somewhat villous toward the base; isthmus ca. 2 cm long; articles 10-12 mm long x 6-8 mm wide; epicarp smooth without prominent veins, villous. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BRAZIL. **Mato Grosso do Sul.** Mun. Corumbá: Amolar, VIII-1908, Hoehne 19 (R 64955); Corumbá, 11-X-1985, Valls & al. 9094 (CEN, CTES); id., Valls & al. 9095 (CEN); Corixo do Areiao, 15 km W do Porto da Manga, 12-X-1985, Valls & al. 9140 (CEN, CTES); 3,7 km W do Porto da Manga, 12-X-1985, Valls & al. 9146 (CEN, CTES).

PARAGUAY. **Amambay.** Ruta 3, arroyo Negla, 35 km S de Bella Vista, 24-VIII-1980, Schinini & al. 20563 (CTES); id., 21-X-1981, Schinini 21450 (CTES); id., 16-XII-1983, Vanni & al. 327 (CTES); id., 345 (CTES); id., 8-IV-1986, Valls & al. 9923 (CEN, CTES); id., 25-II-1994, Krapovickas & al. 45023 (CTES).

Geographic distribution. This species grows in Mato Grosso do Sul, in Brazil, along the Paraguay River, from Amolar to Porto da Manga. The species was also collected in Paraguay, near the Arroyo Negla, a tributary of the Aquidabán River, which drains into the Paraguay River.

We dedicate this species to the botanist Federico Carlos Hoehne, author of several contributions to the knowledge of the genus *Arachis*, and who would collect it for the first time during his participation in the "Comisión Rondon."

53. *Arachis stenosperma* Krapov. & W.C. Gregory *nov. sp.*

Figs. 3,53 and 53a; 27

A. stenosperma M.P. Gregory & W.C. Gregory. J. Hered. 70: 192, 1979, *nomen nudum*. "Parent no. 42" (Hammons & al. 410).

Herba annua vel semiperennis. Caule badii, pilis sericeis 1-2 mm longis villosi. Folia caulis principalis foliolis oblongo-lanceolatis, illa ramorum oblongis usque ovatis, epiphyllo glabro, hypophyllo nervo medio pilis nonnullis sericeis, cetero glabro, margine haud incrassato pilis sericeis setulisque nonnullis instructo. Hypanthium 5-9 cm longum pilis sericeis sparsim vestitum. Calyx 6-7 mm longus setulis immixtis villosus. Vexillum luteum, raro aurantiacum, suborbiculare, usque ad 15 mm longum x 20 mm latum. Fructus biarticulatus paxillo 10-17 cm longo, isthmo 1.5-2.5 cm longo, articulis cylindraceis 17-22 mm longis x 5-7 mm latis apice notabile, pericarpio papyraceo, laevi.

Holotype: BRAZIL. Paraná. Paranaguá, en suelos arenosos del puerto, Vila dos Portuarios [Porto Pedro II], 28-V-1968, Hammons, Langford & Krapovickas 410 (CTES). Isotypes: CEN, G, LIL, MO, NY, SI, US.

Perennial plant, without rhizomes. Taproot, with thin branches, hypocotyl ca. 5 cm long, with small adventitious roots. Mainstem erect, 5-10 cm long, with vegetative branches; basal internodes 5-8 mm long, brown on those parts

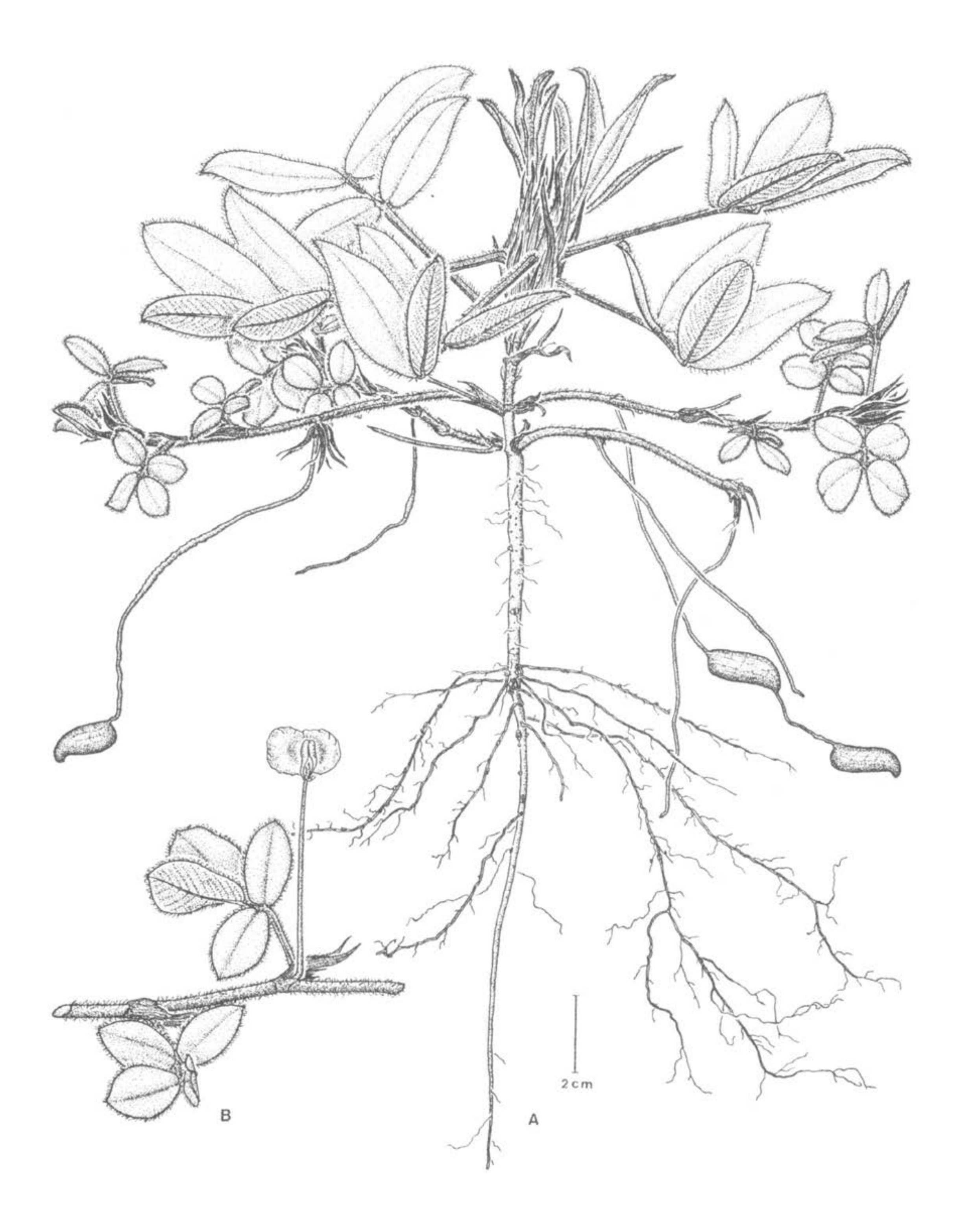


Fig. 27. *Arachis stenosperma*: A, plant; B, branch (HLK.410).

exposed to the light, with silky hairs 1-2 mm long; internodes covered by the stipules toward the apex. Secondary branches procumbent, 80 cm long, on which two vegetative branches alternate with two reproductive branches in succession; internodes ca. 2 cm long, brown, with long silky hairs. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules 10 mm long x 4 mm wide with ca. 7 veins, the free portion 15-25 mm long x 3 mm wide, acute; pulvinus 2 mm long, furrowed, with long silky hairs; petiole up to 5 cm long; rachis 12 mm long; apical leaflets up to 43 mm long x 16 mm wide, basal leaflets up to 40 mm long x 14 mm wide. On the lateral branches, the fused portion of the stipules 10 mm long x 3 mm wide, the free portion 12 mm long x 3 mm wide, acute; petiole 10 mm long; rachis 4 mm long; apical leaflets up to 20 mm long x 13 mm wide. Stipules with silky hairs on the back of the fused portion, surfaces glabrous, margin ciliate. Petiole canliculate, the back and the margin of the canal with long silky hairs, canal itself glabrous or with some very short hairs. Leaflets oblong-lanceolate, more or less acute on the mainstem, oblong to ovate with rounded apex on the lateral branches; upper leaf surface glabrous, lower leaf surface glabrous, with some silky hairs on the midvein, margin not thickened, with silky hairs and scarce, intercalated bristles. Axillary spikes, 4-flowered, axis very short, covered by the stipules. Flowers protected by two bracts; on the first flower, the basal bract is entire, single-veined, 10 mm long x 3 mm wide, with long hairs on the vein and hyaline wings, the upper bract bifid, 11 mm long, with two prominent, pilose veins; the upper flowers with both bracts bilabiate and 2-veined. Hypanthium 5-9 cm long, with scattered, silky hairs. Calyx bilabiate, with long silky hairs and some scattered bristles; the wide lobe tridentate, 6 mm long, the narrow lobe subfalcate, 7 mm long. Standard suborbicular, up to 15 mm long x 20 mm wide, yellow, with faint red lines on the upper surface; wings up to 11 mm long x 9 mm wide, yellow; keel 10 mm long. Anthers 8, dimorphic: 4 large, oblong, basifixed; 4 small spherical, dorsifixed; and 1 staminodium. Fruit biarticulate; peg usually 10 cm long but up to 17 cm; isthmus 1.5-2.5 cm long; articles cylindrical, from 17 mm long x 5 mm wide to 22 mm long x 7 mm wide, with pronounced beak, pericarp papery, epicarp smooth, villous, with very small hairs. Seeds 14 mm long x 5 mm wide but up to 17 mm long x 6 mm wide, cylindrical, apex acute, somewhat curved, seed coat pink. 2n=20 chromosomes (M.P. Gregory & W.C. Gregory 1979).

Selected additional material: BRAZIL. **Mato Grosso**. Mun. Barra do Garças: km 38 da BR-158, Barra do Garças-Nova Xavantina, 450 m, 11-III-1982, Allem & al. 2796 (CEN, CTES); id., yellow flower, 17-VIII-1984, Valls & al. 7762 (CEN, CTES); id., orange flower, Valls & al. 7764 (CEN); 45 km N de Barra do Garças, Faz. Mocambo, 16-I-1989, Krapovickas & al. 42957 (CEN, CTES); 32 km E de Cuiabá, BR-364, 3-VI-1985, Valls & al. 9010 (CEN, CTES); id., Valls & al. 9012 (CEN, CTES); 6,6 km W do rio Bambá, BR-364, en murundús, 3-VI-1985, Valls & al. 9017 (CEN, CTES); 6,7 km W do rio Bambá e 46 km E do rio Coxipó, BR-364, 21-X-1985, Valls & al. 9306 (CEN, CTES). Mun. Rondonópolis: BR-364, ca. 200 m W do rio Vermelho e 300 m W do acesso a Rondonópolis, 22-X-1986, Valls & al. 10309 (CEN, CTES); id., Valls & al. 10310 (CEN, CTES). **Paraná**. Mun. Paranaguá: Porto Dom Pedro II, 1-XII-1911, Dusen 13472 (US); Vila dos Portuarios, 28-V-1968, Hatschbach & al. 19240 (MBM); Costeira, 1-I-1969, Hatschbach 20679 (CTES, MBM). Mun. Antonina: Ponta da Pita, 21-I-1966, Hatschbach & al. 13605 (CTES, MBM, K, NY, SI, US); Ponta da Pita, 28-V-1968, Hammons & al. 408 (CEN, CTES, G, MO, NY, P, US); Antonina, 20-II-1965, Saito & al. 1268 (SI); Porto Antonina, 24-V-1983, Valls 7377 (CEN); Rua da acesso a praia de Ponta de Pita a cerca 200 m da praia, 24-V-1983, Valls 7379 (CEN, CTES). **Rio de Janeiro**. Miers (P); Rio de Janeiro, Gaudichaud 864 (G, P); Rio de Janeiro, Botafogo bay, Miers 3871 (K); Rio de Janeiro, Gaudichaud 53 (P). **São Paulo**. Mun. São Sebastião: en duna costeira, 10-XI-1976, Gibbs & al. 3506 (NY, UEC); Pontal da Olaria, 27-V-1983, Valls & al. 7382 (CEN, CTES); São Francisco, 27-V-1983, Valls & al. 7384 (CEN, CTES). Mun. Cananeia: Cananeia, 22-V-1986, Valls & al. 10229 (CEN, CTES); Butantan, 27-XII-1920, Gehrt 4744 (BM, NY, SP) (specimen illustrated by Hoehne 1940, táb. 9, sub *A. prostrata*); Juqueriqueré, Caraguatatuba, Edwall (SP 1541). Mun. Peruibe: Peruibe, 21-III-1987, Veiga 66 (CTES, IAC); id., 29-XII-1987, Veiga 258 (CTES,

IAC); Ubatuba, 14-V-1987, Romero B-77 (CTES, IAC).

Cultivated material: BRAZIL. **Mato Grosso do Sul**. Campo Grande, EMBRAPA, cult. 2. no. 15 (introduc. no. 71, procedente de BR-158, 45 km N de Barra do Garças, leg. Rainer Schultze-Kraft), 30-I-1979, Krapovickas 34563 (CTES).

Geographic distribution. This is the only species of section *Arachis* that grows on the Atlantic coast, where it is found in soils of almost pure sand, from Rio de Janeiro to Paranaguá in the state of Paraná (Brazil). It was also collected in the southeast part of the state of Mato Grosso, between the area around Barra do Garças to near Cuiabá and Rondonópolis. The material from the two areas is very similar and represents a separation of more than 1000 km which is very difficult to interpret. The topographic character of the territory that separates these two areas presents great difficulties for long distance dispersion by the usual methods accepted for the genus *Arachis* in which propagation by means of subterranean fruits represents a great limitation. In the case of *A. stenosperma,* we do not discard human activity as an agent of dispersal, given its good yield of relatively large fruits. It is interesting to note that on the Atlantic coast it was always found in ruderal habitats, while in Mato Grosso, at least one population grew in a relatively undisturbed environment (Valls 9017).

According to a communication from J.F.M. Valls, there once existed a precolonial road called "Peabira," that departed from São Vicente, near São Paulo, and united the Atlantic coast with the Río Paraná and permitted the indigenous people to communicate with the mountain region, going along the edge of the pantanal to the north (Prous 1992: 374-5; Donlato 1985: 28-31).

Obs. 1. This species is characterized by the long, narrow, cylindrical fruit articles and seeds. Frequently, there is a small supernumerary leaflet present on the leaves, located between the two basal leaflets.

Obs. 2. *Arachis stenosperma* produces highly sterile hybrids with *A. Batizocoi* and *A. monticola*; more than 20% pollen stain with *A. duranensis, A. villosa, A. correntina* and *A. Cardenasii*; and up to 88.5% with *A. Diogoi*. Outside section *Arachis* it produced a hybrid with *A. glabrata* var. *glabrata*, in section *Rhizomatosae*, but the hybrid plants never flowered.

54. *Arachis praecox* Krapov., W.C. Gregory & Valls *nov. sp.*

Fig. 3,54

Herba annua. Radix palaris, debilis. Caulis principalis brevis, 2-3 cm longus, ramis procumbentibus. Caulis pilis 1 mm longis subvillosus, deinde glabrescens. Stipulae glabrae, margine ciliis sparsis 0.5 mm longis instructae. Folia glabra, illa caulis principalis foliolis oblongis, illa ramorum foliolis obovatis, epiphyllo laevi, hypophyllo nervis et margine manifestioribus, margine pilis paucis brevibus setulisque nonnullis ornato. Hypanthium 4-6 cm longum glabrum vel subglabrum. Calyx glaber, 4 mm longus. Vexillum aurantiacum, 12 mm longum. Fructus biarticulatus, paxillo 12 cm longo, isthmo ca. 3 cm longo, articulis 13-16 mm longis x 6-7 mm latis, apice recurvo pericarpio laevi.

Holotype: U.S.A. Texas. Stephenville, cult., originally from Brazil, MT, 71 km N of Cáceres on road to Barra do Bugres, Valls & al. 6416, 10-IX-1985, Simpson s/n (CEN). Isotypes: CTES, K, US.

Annual plant with weak taproot. Mainstem short, 2-3 cm long, covered by stipules. Procumbent branches 40-50 cm long, stem subvillous, with hairs 1 mm long, scattered on the younger parts. Leaves tetrafoliolate, stipules glabrous, margin with scattered cilia 0.5 mm long; petiole and rachis glabrous, except for a few hairs on the pulvini and on a transverse rib at the height of the first pair of leaflets; leaflets with both surfaces glabrous, upper surface smooth, lower surface with veins and margin slightly evident, margin glabrous or with a few short hairs and some small bristles. On the mainstem: stipules with the fused portion ca. 6 mm long, free portion 14 mm long, petiole 17 mm long, rachis 4 mm long,

leaflets oblong, the distal ones ca. 16 mm long x 6 mm wide, the proximal ones ca. 15 mm long x 5 mm wide. On the lateral branches: stipules with the fused portion 4 mm long, free portion 7 mm long x 3 mm wide, petiole 12 mm long, rachis 5 mm long, leaflets obovate, the distal ones ca. 14 mm long x 10 mm wide, the proximal ones ca. 14 mm long x 9 mm wide. Hypanthium 4-6 mm long, glabrous or subglabrous. Calyx with the wider lobe 4 mm long, glabrous, the narrow lobe subfalcate, 4.5 mm long. Standard ca. 12 mm long x 13 mm wide, orange. Fruit biarticulate, peg ca. 12 cm long, isthmus 2.5-3 cm long, articles 13-16 mm long x 6-7 mm wide, with parrot's beak, pericarp smooth.

Additional material: BRAZIL. **Mato Grosso.** Mun. Barra do Bugres: 71 km N de Cáceres, camino a Barra do Bugres, 31-VIII-1981, Valls & al. 6416 (CEN); id., 31-V-1985, Valls & al. 8965 (CEN, CTES); 14,1 km NW do rio Cachoeirinha e 5,7 km antes do rio Salobra na estrada de Cáceres a Barra do Bugres, 26-X-1985, Valls & al. 9397 (CEN, CTES); id., 3-XI-1986, Valls & al. 10467 (CEN, CTES).

Cultivated material: U.S.A. **Texas**. Stephenville, originally from Brazil, MT, Valls & al. 6416, 15-VIII-1985, Simpson s/n (CTES); id., 21-IX-1985, Simpson s/n (CTES).

Geographic distribution. This species is known only from the type locality, located 71 km to the north of Cáceres, on the road to Barra do Bugres, in the state of Mato Grosso (Brazil). It grows in a field subject to flooding with small rises ("murundus") covered by "cerrado" vegetation, on poorly drained, compacted sandy clay soil.

55. *Arachis palustris* Krapov., W.C. Gregory & Valls *nov. sp.*

Fig. 3,55

Herba annua. Stipulae glabrae vel pilis paucis basi instructae, margine subciliatae. Foliola elliptica, in caule principale latius lanceolata. Epiphyllum glabrum. Hypophyllum glabrum, margine ciliato paucisetuloso. Hypanthium tenue, villosum, 15-50 mm longum. Calyx 4-6 mm longus, glaber vel paucis pilis brevibus instructus, setulae desunt. Vexillum 7-8 mm longum x 10 mm latum, velutino-aurantiacum. Fructus biarticulatus paxillo 3-15 cm longo, articulis 9.5-12.5 mm longis x 5.5-6 mm latis, pericarpio laevi.

Holotype: BRAZIL. Tocantins. Mun. Miracema do Norte, 13 km do rio dos Bois, BR-153, km 840, 9°29'S, 48°36'W, 250 m alt., anual, na área inundada e na agua corrente; mata ciliar aberta, dominada por "babaçu" e *Heliconia*, solo orgánico encharcado. As folhas con sintomas de ataque de *Cercospora arachidicola*. Flor amarelo-alaranjada. 7-III-1982. Valls, Krapovickas, Rao & Silva 6536 (CEN). Isotypes: CTES, G, GH, LIL, MO, NY, US.

Annual plant. Root small, 1-2.5 mm in diameter (hypocotyl 2-3 mm in diameter), shallow. Mainstem ca. 15 cm long, erect, opposing branches of the first two nodes separated 2-4 cm; apical internodes very short, covered by the stipules. Lateral branches procumbent, up to 85 cm long. Stems glabrous or with scattered 1 mm long hairs, occasionally more dense toward the end of the branches; internodes with abundant adventitious roots on the submerged parts. Leaves tetrafoliolate, those of the mainstem very similar to those of the lateral branches; leaflets elliptical, somewhat more lanceolate on the central axis and occasionally somewhat obovate on the lateral branches. The fused part of the stipules usually 7 mm long, up to 12 mm, the free part 13 mm long, up to 25 mm; petiole 20 mm long, up to 45 mm long and rachis 5 mm long, up to 10 mm; apical pair of leaflets 18 mm long x 10.5 mm wide, up to 42 x 17 mm, basal pair 16 mm long x 9 mm wide, up to 33 x 12 mm. Stipules with glabrous faces or with some hairs toward the base, margin with not too dense cilia; the free part acute 2-2.5 mm wide at the base. Petiole and rachis canaliculate with some 1 mm long hairs on the back, canal and margins of the canal glabrous. Pulvinus more or less villous (villous on very young leaves). Leaflets apiculate, both faces glabrous; upper side smooth and lower side almost smooth with somewhat marked veins; margin barely noticeable, lightly ciliate and with some scattered, weak bristles. Flowers in very short spikes, few-flowered, all along the lateral

branches. Bracts weak, ca. 10 mm long, ciliate on the margin and with a few very weak bristles toward the apex. Hypanthium slender, 15-50 mm long, villous. Calyx with some scattered silky hairs, without bristles; upper lobe 4-5 mm long, lower lobe falcate, 6 mm long. Standard 7-8 mm long x 10 mm wide, orange-yellow with some very delicate reddish lines on the upper face. Fruit biarticulate; peg 3-15 cm long, glabrous; articles 9.5-12.5 mm long x 5.5-6 mm wide, covered by a delicate coat of very small caducous hairs; pericarp almost smooth with an open and scarcely marked reticulation that can be seen only when the hairs fall off; beak accentuated. Seed 6-11 mm long x 4-5 mm wide.

Additional material: BRAZIL. **Maranhão.** Mun. Carolina: 12 km E de Carolina, BR-230 para Balsas, 7°22'S, 47°25'W, 170 m alt., local encharcado periodicamente, 13-III-1982, Valls & al. 6611 (CEN, CTES, GH, K, MO, NY, P, SI, US); 10-12 km E de Carolina, 18-III-1985, Valls & al. 8377 (CEN, CTES); 38 km E de Carolina, BR-230, 18-III-1985, Valls & al. 8381 (CEN, CTES). **Tocantins.** Mun. Miracema do Norte: 14,6 km S do rio dos Bois, 27-VIII-1984, Valls & al. 7881 (CEN, CTES); id., 7883 (CEN, CTES). Mun. Filadelfia: 7°25'S, 43°37'W, Valls & al. 13023 (CEN).

Geographic distribution. This is the wild species of section *Arachis* that grows farthest north. The area extends from 7°22'S to 9°29'S, found on both sides of the Tocantins River. It was collected in totally flooded soils, where the submerged plants were in full flower.

56. *Arachis benensis* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*

Figs. 3,56; 28,A-B

Herba annua. Caulis angulosus, novellus subvillosus. Stipulae subglabrae, dorso et basi pilis longis nonnullis instructae. Folia caulis principalis foliolis lanceolatis, acuminatis, illa ramorum foliolis lanceolatis usque ovalibus, omnia epiphyllo laevi, glabro, hypophyllo glabro vel pilis longis nonnullis in nervo medio, in margine submanifesto paucis pilis longis caducis setulisque brevibus nonnullis instructo. Hypanthium 20-50 mm longum, villosum. Calyx 4-5 mm longus, setulis nonnullis immixtis villosus. Vexillum ca. 8 mm longum, aurantiacum. Alae 5 mm longae, luteae. Fructus biarticulatus paxillo 2-12 cm longo, glabro, isthmo ca. 15 mm longo, articulis 10-12 mm longis x 5-6 mm latis, laevibus, apice recurvo.

Holotype: BOLIVIA. Beni. Trinidad, en césped, cerca de la pista principal del aeropuerto, 9-IV-1979, Krapovickas, Gregory, Simpson, Pietrarelli & Schinini 35005 (CTES). Isotypes: CEN, G, GH, K, LPB, MO, NY, RB, SI, P, US.

Annual plant. Taproot weak, 3-4 mm in diameter, shallow. Mainstem erect, up to 45 cm long, internodes up to 45 mm long, lateral branches procumbent, pressed closely to the soil, ca. 40 cm long; stem angular, somewhat villous on the young parts, hairs white, ca. 2 mm long, internodes 15-30 mm long. Leaves tetrafoliolate. On the mainstem the fused part of the stipules 8 mm long, free part 14 mm long; petiole up to 35 mm, rachis 7 mm long; apical pair of leaflets up to 31 mm long x 8 mm wide, basal pair up to 26 mm long x 7 mm wide. Fused portion of the stipules on the lateral branches 6 mm long, free part ca. 12 mm long; petiole up to 25 mm long, rachis 7 mm long; apical pair of leaflets up to 22 mm long x 11 mm wide, basal pair up to 19 mm x 8 mm. Stipules subglabrous with some long hairs toward the base and on the back near the insertion of the petiole; the free part linear, ca. 2 mm wide at the base, 3-4 veined, margin softly ciliate. Back of petiole subglabrous, with some long hairs, upper face canaliculate, margins of the canal pilose; pulvinus glabrous or somewhat pilose; rachis narrow, margins of the canal pilose. On the mainstem, leaflets lanceolate, acuminate; on the lateral branches, leaflets lanceolate to oval; upper surface glabrous, smooth; lower surface glabrous or with some long hairs on the midvein, margin somewhat prominent with a few long fragile hairs and some short bristles. Flowers along the lateral branches, in very short, few-flowered spikes. Hypanthium 20-50 mm long, villous. Calyx 4-5 mm long, bilabiate, villous and with some bristles. Standard ca. 8 mm long, orange; wings 5 mm long, yellow. Fruit subterranean, biarticulate; peg 2-12 cm long, aerial part glabrous; isthmus ca. 15 mm long;

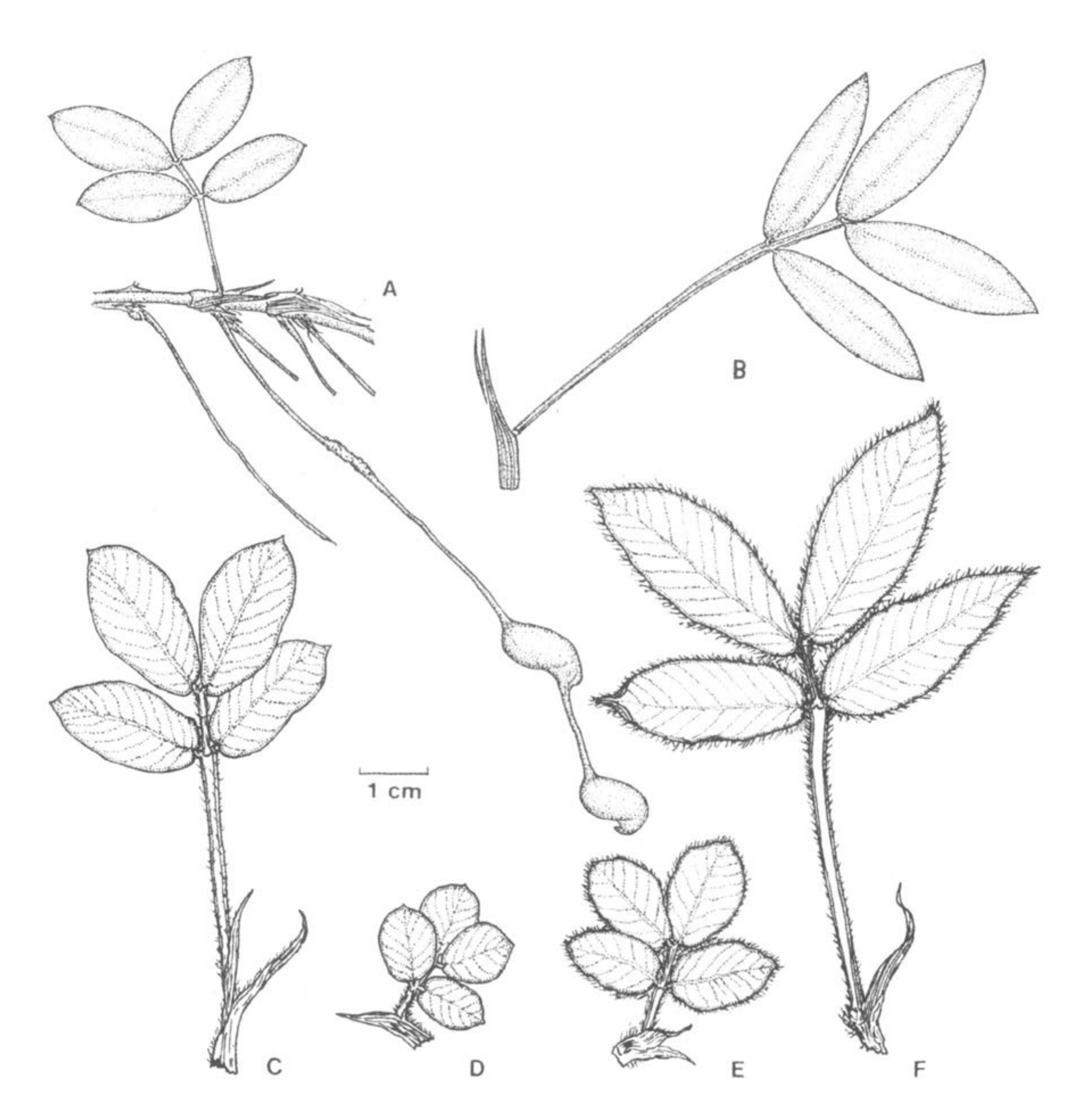


Fig. 28. *Arachis benensis*: A, portion of branch (K.35005); B, leaf from mainstem (K.35006). *A. helodes*: C, leaf from mainstem; D, leaf from lateral branch (G.9926). *A. correntina*: E, leaf from lateral banch; F, leaf from mainstem (K.7830).

articles 10-12 mm long x 5-6 mm wide, smooth, with strong beak; the peg is inserted on the back at the basal end. Seed 7-8 mm long x 4-5 mm wide, with the distal end pointed and somewhat curved. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BOLIVIA. **Beni.** Trinidad, savanna, I-1965, Braun 7 & 8 (US); Trinidad, S.A.I. Station, 250 m, 9-XI-1965, Booke 48 (K); Trinidad, en matorrales vecinos al aeropuerto, 14-IV-1979, Krapovickas & al. 35006 (CEN, CTES, G, GH, LPB, MO, NY, US); Guayaramerín, aeropuerto, 18-IV-1979; Krapovickas & al. 35007 (CEN, CTES, GH, K, LPB, MO, NY, US); Guayaramerín, aeropuerto, 21-XI-1988, Williams 860 (CTES); id., 861 (CTES).

Geographic distribution. This species was

collected in Trinidad and in Guayaramerín, localities on the Mamoré River in the department of Beni and in northern Bolivia. It grows in savannahs among grasses or in the border of shrubby brush in clayey soil.

57. *Arachis trinitensis* Krapov. & W.C. Gregory *nov. sp.*
Fig. 3,57

Herba annua. Radix palaris. Caulis apicem versus pilis 1.5-2 mm longis villosus. Stipulae setulis destitutae, glabrae vel pilis parvissimis adpressis sparsim vestitae, dorso villosae. Caulis principalis erectus, foliolis oblongo-lanceolatis, rami procumbentes foliolis oblongis usque obovatis. Epiphyllum laeve, glabrum. Hypophyllum fere laeve, in foliis junioribus pilis parvis adpressis et nonnullis ca. 2 mm longis sparsim vestitum in foliis vetustioribus fere solum pili longi nervo medio adsunt, margine pilos paucos adpressos ca. 1 mm longos gerentes. Hypanthium 20-50 mm longum, villosum. Calyx 5-6 mm longus, villosus et large setulosus. Vexillum 10 mm longum, aurantiacum. Fructus subterraneus, biarticulatus paxillo 5-10 cm longo, glabro, articulis 9-11 mm longis x 5-6 mm latis, pericarpio laevi.

Holotype: BOLIVIA. Beni. Prov. Cercado, Trinidad, Campus of the Universidad Técnica del Beni, 2.5 km N of Trinidad. Procumbent. Mainstem erect, to 40 cm high. Orange standard, yellow wings. Pegs short, white. Dark grey sandy clay, 25-XI-1988, Williams 866 (CTES).

Annual plant with taproot. Mainstem 10-40 cm long, erect, covered by stipules, branches procumbent. Stem villous on the younger parts, hairs 1.5-2 mm long. Leaves tetrafoliolate, stipules with glabrous surfaces or with very small sparse adpressed hairs, back villous, margin ciliate, without bristles; petiole and rachis villous, hairs 2 mm long, upper surface glabrous and smooth, lower surface nearly smooth, younger leaves with small dispersed adpressed hairs and a few long hairs ca. 2 mm long, older leaves commonly with only long hairs on the midvein; margin with few adpressed hairs ca. 1 mm long. On the mainstem, stipules with the fused portion ca. 10 mm long and the free portion ca. 16 mm long x 2-3 mm wide, petiole 25-40 mm, rachis 8-12 mm long, leaflets oblong-lanceolate, the distal ones 30-35 mm long x 11-18 mm wide, the proximal leaflets 26-29 mm long x 9-14 mm wide. On the lateral branches, stipules with the fused portion ca. 5 mm long and the free portion 10-11 mm long x 3-4 mm wide, petiole 9-10 mm long, rachis 6-7 mm long, leaflets oblong to obovate, the distal ones ca. 17 mm long x 10-14 mm wide, the proximal ones ca. 15 mm long x 8-11 mm wide. Hypanthium 20-50 mm long, villous. Calyx 5 mm long, lobe subfalcate, 6 mm long, villous, with abundant bristles. Standard ca. 10 mm long, orange, wings yellow. Fruit subterranean, biarticulate; peg 5-10 cm long, glabrous, articles 9-11 mm long x 5-6 mm wide, pericarp smooth.

Additional material: BOLIVIA. **Beni.** Trinidad, Universidad Técnica del Beni, 20 m NE del edificio laboratorios. Fruto liso, 21-III-1990, Williams 1117 (CTES).

Cultivated material: ARGENTINA. **Córdoba.** Manfredi, E.E.A. (INTA), cult. no. 42, origin: Williams 1117, 21-III-1991, Krapovickas 43795 (CTES); id. 27-III-1992, Krapovickas 44091 (CTES).

Geographic distribution. This species is known only from the type locality, in Trinidad, capital of the Beni department (Bolivia), at 236 m elevation above sea level.

58. *Arachis decora* Krapov., W.C. Gregory & Valls *nov. sp.*
Fig. 3,58

Herba annua. Radix palaris. Caulis violaceus, apicem versus villosus, deorsum versus glabrescens. Stipulae dorso et basi villosae, margine ciliatae. Setulae in stipulis, petiolis et in rachidi adsunt. Caulis principalis erectus, foliolis ovato-lanceolatis. Rami procumbentes foliolis obovatis usque oblongis. Epiphyllum laeve, glabrum. Hypophyllum nervis et margine vix conspicuis, glabrum vel pilis parvissimis, adpressis, nervo medio paucis pilis majoribus, margine pilis parvis setulisque nonnulis vestitum.

Hypanthium 3 cm longum, partim villosum. Calyx 4 mm longus, labium majore subglabro, labium minore subfalcato villoso et setuloso. Vexillum aurantiacum. Fructus subterraneus paxillo glabro, articulis ca. 14 mm longis x 7 mm latis, apice recurvo, pericarpio laevi.

Holotype: BRAZIL. Goiás. Mun. Campos Belos, 20 km a nordeste de Campos Belos na estrada para Aurora do Norte, 13°01'S, 46°42'W, 690 m s.m., plantas vigorosas crescendo em local perturbado recentemente em beira de barranco ao longo da estrada, vegetaçao baixa secundaria em antiga area de mata, 12-IV-86, Valls, Simpson & Werneck 9955 (CEN). Isotype: CTES.

Annual plant, with weak taproot. Mainstem erect, ca. 15 cm long, procumbent branches ca. 50 cm long. Stems purple, villous toward the apices, glabrescent, bristles present. Leaves with 4 leaflets, stipules villous toward the base and on the dorsal surface, numerous bristles toward the base, ciliate margin, short hairs. Petiole and rachis partially villous and with abundant bristles on the dorsal surface. Leaf upper surface glabrous, smooth, lower surface with veins and margin subdued, glabrous or with very small adpressed hairs and a few larger hairs on the midvein, margin with small sparse hairs and with short bristles. On the mainstem: stipules with the fused portion ca. 10 mm long, free portion ca. 20 mm long x 1.5 mm wide, petiole ca. 40 mm long, rachis ca. 8 mm long, leaflets ovate-lanceolate, the distal ones ca. 40 mm long x 14 mm wide, the proximal ones ca. 32 mm long x 12 mm wide. On the lateral branches: the fused portion of the stipules ca. 5 mm long, the free portion ca. 12 mm long x 2 mm wide, petiole ca. 18 mm long, rachis ca. 5 mm long, distal leaflets obovate, ca. 21 mm long x 13 mm wide, proximal leaflets oblong, ca. 17 mm long x 10 mm wide. Hypanthium 3 cm long, partially villous. Calyx 4 mm long, larger lobe subglabrous, with a few hairs and an occasional bristle at the apex, smaller lobe subfalcate, villous and with various bristles. Standard orange. Fruit subterranean, peg glabrous, articles ca. 14 mm long x 7 mm wide, with parrot's beak, smooth.

Additional material: BRAZIL. **Goiás.** Nova Roma, entrada da Fazenda Ouro na estrada de Nova Roma a Iaciara, Skorupa & al. 644 (CEN); Campos Belos, 20 km ao NE de Campos Belos na estrada para Aurora do Norte, Allem 3485 (CEN); id., Valls & al. 9953 (CEN). Mun. Teresina de Goiás: 13°26'S, 47°08'W, Valls & al. 12900 (CEN). Mun. Monte Alegre de Goiás: 13°18'S, 46°42'W, Valls & al. 13290 (CEN); id., 13°14'S, 46°44'W, Valls & al. 13348 (CEN). Mun. Simolandia: 14°28'S, 46°29'W, Valls & al. 13371 (CEN). **Tocantins.** Mun. Combinado: 12°55'S, 46°35'W, Valls & al. 12893 (CEN).

Geographic distribution. This species is known only from places close to the type locality, in northeastern Goiás and southern Tocantins (Brazil).

59. *Arachis Herzogii* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*

Fig. 3,59

Herba perennis. Radix palaris. Rami prostrati. Caules novelli villosi, deinde glabri. Stipulae subglabrae, basi villosae. Caulis principalis foliolis lanceolatis, rami foliolis oblongis obovatisve. Epiphyllum glabrum, laeve, margine sat incrassato, hypophyllum villosum, pilis ca. 2 mm longis sparsim immixtis, margine sat incrassato et nervis perspicuis. Hypanthium 40-45 mm longum, villosum. Calyx 5-6 mm longus, villosus, setulosus. Vexillum 11 mm longum, aurantiacum. Fructus subterraneus, biarticulatus, articulis 8-10 mm longis x 5-5.5 mm latis, pericarpio laevi.

Holotype: BOLIVIA. Santa Cruz. Prov. Chiquitos, 18 km N de San José 60°47'W, 17°47'S, camino a San Ignacio, ca. 300 m s.m., perenne, ramas prostradas, corola anaranjada, 28-IV-1980, Krapovickas & al. 36030 (CTES). Isotypes: CEN, GH, K, LIL, LPB, MO, NY, US.

Perennial plant, with taproot. Branches prostrate, young shoots quadrangular, villous, with hairs 2 mm long, cylindrical and glabrous towards the base; internodes 2-3 cm long. Stipules with the fused portion 5-7 mm long and the free portion 14-17 mm long x 4-5 mm

wide, dorsal surface villous, surfaces villous toward the base, the rest subglabrous, with a few long hairs especially on the veins and almost to the apex. Leaves tetrafoliolate, petiole 3-10 mm long, somewhat longer on the leaves of the mainstem; rachis 3-7 mm long, both with villous dorsal surface, a glabrous petiole-rachis canal divided by a transverse line of hairs at the first pair of leaflets; distal leaflets 18-33 mm long x 8-18 mm wide, proximal leaflets 15-26 mm long x 7-13 mm wide, oblong or obovate on the lateral branches and lanceolate on the mainstem, upper side glabrous and smooth with the margin somewhat thickened, the underside villous with hairs ca. 2 mm long, scattered, allowing the epidermal surface to be seen, margin somewhat thickened and marked veins. Hypanthium 40-45 mm long, villous. Calyx 5-6 mm long, villous and with bristles. Standard 11 mm long, orange. Fruit subterranean, biarticulate, articles 8-10 mm long x 5-5.5 mm wide, smooth.

Additional material: BOLIVIA. **Santa Cruz**. Prov. Chiquitos, 6.5 km N de San José, 60°47'W, 17°47'S, camino a San Ignacio, ca. 300 m s.m., 28-IV-1980, Krapovickas & al. 36029 (CTES, GH, LPB, MO, NY, SI, SP, US).

Geographic distribution. This species grows at 17°47'S, near San José de Chiquitos, in the southern part of the department of Santa Cruz (Bolivia), in patches of light-colored sand and gravel, in a not very dense forest.

We dedicate this species to Theodor Herzog, botanical explorer and author of various works on the vegetation of eastern Bolivia.

60. *Arachis microsperma* Krapov., W.C. Gregory & Valls *nov. sp.*

Fig. 3,60

Herba perennis. Radix palaris, valida. Rami procumbentes. Caulis internodiis 1-4 cm longis, junioribus villosiusculis. Folia parva. Stipulae adpresso-pilosae, dorso villosiusculae, basi setulas longas gerentes. Petiolus rachisque villosi setulisque nonnullis instructi. Foliola oblonga ad obovata, epiphyllo laevi, glabro, hypophyllo adpresso-piloso, nervo medio sursum pilis longis, margine pilis parvis adpressis, ciliis 1 mm longis etiam setulis brevibus munito. Hypanthium ca. 7 cm longum, villosum. Vexillum 10 mm longum, aurantiacum. Fructus subterraneus, biarticulatus articulis parvis usque ad 9 mm longis x 4 mm latis, pericarpio valde reticulato.

Holotype: BRAZIL. Mato Grosso do Sul. Mun. Bela Vista, junto a alfandega de Bela Vista em gramados ornamentais, area urbanizada proxima a margem do rio Apa, 22-IV-1984, Valls & al. 7681 (CEN). Isotype: CTES.

Perennial plant, ramose; with taproot. Branches prostrate, internodes 1-4 cm long, shoot somewhat villous on the younger parts. Leaves with four leaflets. Stipules with the fused portion 4-5 mm long and the free portion 10-12 mm long, dorsal surface villous with adpressed hairs and long bristles. Petiole 8-15 mm long, rachis 4-5 mm long, villous with some bristles, upper surface with small adpressed hairs; leaflets from oblong to obovate, slightly apiculate, upper surface glabrous and smooth, lower surface with adpressed hairs and long hairs on the midvein, margin with small adpressed hairs, cilia 1 mm long and short bristles; distal pair 12-18 mm long x 6-10 mm wide, proximal pair 12-15 mm long x 5-8 mm wide. Hypanthium ca. 7 cm long, villous. Calyx 6-7 mm long, villous and with bristles. Standard orange, ca. 10 mm long. Fruit subterranean, biarticulate, peg glabrous, articles up to 9 mm long x 4 mm wide, pericarp with very marked reticulation.

Additional material: BRAZIL. **Mato Grosso do Sul.** Bela Vista, entrada de Bela Vista desde Jardim, 24-IV-1985, Valls & al. 8711 (CEN, CTES).

Geographic distribution. This species is known only from the type locality, Bela Vista, on the Apa River in the SW part of the state of Mato Grosso do Sul (Brazil).

61. *Arachis villosa* Benth.

Fig. 3,61

Bentham, Trans. Linn. Soc. London 18: 159, 1841,

"*Ad Rio Grande Brasiliae Meridionalis. Tweedie.*" Benth., Fl. bras. 15(1): 87, 1859. Arechavaleta, Anales Mus. Nac. Montevideo 3(20): 355, 1901. Chevalier, Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 760, 1933. Parodi, Revista Argent. Agron. 1(2): 136, 1934. Burkart, Darwiniana 3(2): 267, fig. 19, g, i, j, 1939. Hoehne, Flora Brasílica 25(2) Part. 122: 14, táb. 8, 1940. Burkart, Proc. 8th Amer. Sc. Congr. 3: 175, fig. 1, a-h, 1942. Hartley, Div. Pl. Ind., Melbourne, Div. Rep. 7: 34, fig. 2, 1949. Hermann, Agric. Monogr. USDA 19: 11, fig. 9, 1954.

A. prostrata Benth. var. *villosa* (Benth.) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9(90): 100, 1929.

Stylosanthes leiocarpa auct. non Benth., Grisebach, Symbol. fl. Argent. 106, 1879. Lorentz, Veg. Nordeste Entre Ríos, 38, 62, 133, 171, 1878.

Perennial plant. Taproot thick, reaching 1.5 cm in diameter, lateral roots slender, without enlargements. Mainstem erect, 10-35 cm tall, little-branched toward the base in year-old plants, with inflorescences on the upper nodes; internodes angular, villous, 10-20 mm long. Lateral branches procumbent, spreading, up to 1 m long, non-rooting, little-branched; internodes angular, villous, up to 40 mm long. Leaves tetrafoliolate. On the mainstem the fused portion of the stipules up to 9 mm long x 6 mm wide, the free tips acute, up to 20 mm long x 2 mm wide at the base; petiole 20-35 mm long; rachis 10 mm long; apical leaflets usually 23 mm long x 11 mm wide; basal leaflets 21 mm long x 9 mm wide. On leaves of the lateral branches, the fused portion of the stipules from 3-5 mm long x 5 mm wide, the free part 7-15 mm long x 2.5-3 mm wide at the base, acute; petiole ordinarily 10 mm long (from 3 to 18 mm), rachis 3-7 mm long; the apical pair of leaflets usually 15 mm long x 9 mm wide (up to 18 mm x 11 mm); the basal pair of leaflets 13.5 mm long x 8.5 mm wide (up to 16 mm x 9 mm). Stipules with surfaces almost glabrous, more or less villous on the back of the fused portion, without bristles, margin with long, more or less adpressed cilia. Petiole and rachis somewhat canaliculate, villous on the back. Pulvinus densely villous. Leaflets of the mainstem ovate, more or less acute at the apex, those of the lateral branches tend to be more rounded to obovate, the apex usually mucronulate, margin thickened, evident on both surfaces in dried specimens but principally on the lower surface; the upper surface smooth, pubescent to more or less villous, the lower surface usually densely villous, margin ciliate and occasionally with some short bristles. Inflorescences axillary with short axis, covered by the base of the stipules, 1-3-flowered. Hypanthium ca. 5 (3-6.4) cm long, pilose. Calyx bilabiate, with long silky hairs and long bristles, the wider lobe 6-6.5 mm long, the narrow lobe falcate, 7 mm long. Standard 13-14 mm long x 13 mm wide, yellow at the base and orange toward the margin; wings 8 mm long, usually yellow, occasionally with the upper half orange. Pegs occurring along the length of the branches, up to 20 cm long, reddish, with a few very small scattered hairs; fruit biarticulate, articles 10-15 mm long x 7-8 mm in diameter, the terminal article always somewhat larger; pericarp prominently reticulate, beak manifest. Seed oval-elliptical, 10-11 mm long x 6 mm wide, testa brown, very thin. 2n=20 chromosomes (Krapovickas & Rigoni 1951).

Holotype: Brazil. Rio Grande, Tweedie, 1837 (K!).

Selected additional material: ARGENTINA. **Buenos Aires.** Facultad de Agronomía y Veterinaria, Jardín Botánico, adventicia, 19-II-1934, Parodi 11885 (BAA); id., 15-VI-1937, Clos 6135 (BAB); id., 4-VI-1937, Burkart (SI 391); id., 12-II-1938, Burkart 9050 (SI); id., 27-XI-1936, Archer 4569 (K, US): Instituto Darwinion, cult. 18-XII-1942, Bartlett 19244 (NY, US). **Corrientes.** Dep. Paso de los Libres: Paso Troncón, 16-XII-1946, Huidobro 3712 (CTES, LIL); Paso de los Libres, 12-I-1945, Ibarrola 2075 (LIL, NY); Paso de los Libres, Hotel de Turismo, 27-III-1964, Krapovickas & al. 11292 (CTES, MO); id., 19-V-1968, Hammons & al. 357 (CTES); Paso de los Libres, Laguna Mansa, 18-II-1972, Krapovickas & al. 21697 (CTES, G, NY); Bonpland, 21-II-1945, Ibarrola 2148 (LIL, NY); Estancia "El Recreo", Bonpland, 8-XI-1973, Lourteig & al. 2760 (CTES, P). Dep. Monte Caseros: Juan Pujol, 10-II-1945, Ibarrola 2391 (LIL, NY); Mocoretá, 13-II-1945, Ibarrola 2406 (LIL, NY); El Ceibo, frente a isla Correntina, 22-I-1942, Rosengurtt B-3676 (CTES, MVFA, SI); Monte Caseros, Cambaí, 10-II-1957, Nicora 5699 (SI); río Miriñay y río Uruguay, 28-III-1964, Krapovickas & al. 11311 (CEN, CTES, LIL,

MO); Campo Gral. Avalos, ayo. Curupí, 21-II-1979, Schinini, & al. 17524 (CTES, G, MO). **Entre Ríos.** Federación, Mandisobí, 17-II-1876, Lorentz 743 (BAF); Federación, 20-XII-1946, Meyer 11092 (LIL); Santa Ana, 24-IX-1961, Burkart 22585 (SI). Dep. Colón: Colón, III-1927, leg.? (BAB 51612); Colón, 28-XI-1946, Meyer 10631 (LIL). Dep. Uruguay: estancia La Selmira, 30-III-1967, Pederson 8198 (K).

URUGUAY. Banda Oriental del Uruguay, Saint Hilaire 2369 (K, P); id., 363 & 366 (K); Sauce [Dep. Colonia?], II-1900, Arechavaleta 5368a (MVM). **Artigas.** Bella Unión, XII-1928, Herter 84489 (G, MVM, SI); id., 28-I-1948, Castellanos 15980 (LIL); San Gregorio, 31-III-1962, del Puerto 2103 (MVFA); ayo. Guaviyú (Paredón), 19-XII-1977, del Puerto & al. 14787 (MVFA); id., 13-III-1978, del Puerto & al. 15170 (MVFA); ayo. Sauce, 27-I-1964, Marchesi 1096 (MVFA). **Salto.** Belén, 12-XII-1905, Berro 5886 (MVFA); río Uruguay y ayo. San Antonio Grande, 27-I-1937, Rosengurtt B-941 (CTES, MVFA). **Paysandú.** Chapicuy, 22-II-1941, Rosengurtt B-3280 (MVFA); Chapicuy, Santa Sofía, 15-XI-1942, Rosengurtt B-3280½ (CTES, MVFA). **Río Negro.** Ayo. Caracoles, 22-XI-1913, Berro 7092 (MVFA); río Uruguay y ayo. Negro, Chebataroff (CTES 16279); San Javier, 2-V-1969, del Puerto & al. 8388 (MVFA); río Uruguay y ayo. Guaviyú, Saladero, 17-I-1967, Rosengurtt & al. 10587 (MVFA); Nuevo Berlín, 17-III-1989, Davies & al. 19538 (CTES, MVFA); id., 5-VI-1992, Izaguirre & al. 20991 & 20995 (MVFA). **Soriano.** Arenal Grande, 29-XI-1932, Cabrera 2585 (SI, NY). **Colonia.** Puerto del Sauce, 23-II-1900, Berro 1117 (CTES, MVFA, SI); Nueva Helvecia, 11-II-1916, Berro (MVFA); Artilleros, 17-XI-1949, Burkart 18159 (CTES, SI); Artilleros, 26-IV-1968, Hammons & al. 8, 10 y 14 (CTES); Conchillas, 19-XII-1921, Castellanos (BA); Colonia, I-1917, Hauman (BA); Colonia, Clos 3225 y 6292 (BAB, CTES); Playa Fomento, 31-XII-1968, Rosengurtt B-11001 (MVFA); id., 10-I-1962, del Puerto 1039 (MVFA); id., 4-VI-1992, Izaguirre & al. 20993 (MVFA); Balneario Fomento, 10-I-1992, Baycé & al. 20763 (CTES, MVFA); Playa Real de S. Carlos, 7 km N de Puerto Colonia, 17-I-1937, Archer 4952 (K, NY, US); Ayo. Pintos, Artilleros, near Puerto Platero, 17-XII-1943, Bartlett 21201 (NY, US); coast of the Uruguay, between arroyo Del Vancis & Colonia, Tweedie 350 (K); Punta Gorda, 19-I-1962, Rosengurtt & al. 8641 (MVFA); Indaré, Rosario, 23-III-1963, del Puerto & al. 2464 (MVFA); Carmelo, Playa Sere, Izaguirre & al. 19665 (CTES, MVFA); Nueva Palmira, 8-III-1964, Arrillaga 1973 (MVFA). **San José.** Arazatí, 24-XII-1939, Legrand 1696 (SI); id., 17-III-1957, Arrillaga 644 (MVFA); id., 24-IV-1960, Arrillaga 898 (MVFA); Boca del Cufré, 10-I-1992, Baycé & al. 20780 (CTES, MVFA); desembocadura del ayo. Cufré, 28-II-1967, Lema 6505 (MVFA); Barra del arroyo San Gregorio, 2-I-1969, Lema & al. 8234 (CTES, MVFA); Rincón del Pino, 3-XI-1971, Reu 10868 (MVFA). **Montevideo.** Montevideo, Sello d.883 (K); Montevideo, III-1900, Berro s/n (CORD); entre La Colorada y Punta Espinillo, 4-III-1983, Izaguirre & al. 17115 (MVFA).

Geographic distribution. To date, the species is known only from Argentina and Uruguay, where it grows in the dunes and sandy soils along the Río Uruguay and on the Uruguayan coast of the Río de la Plata to the edge of the city of Montevideo. In the city of Buenos Aires (Parodi 1934), it was found in sand transported from the Uruguayan coast of the Río de la Plata. It has been mentioned as existing in Rio Grande, but it has not been possible to confirm this.

Obs. 1. A problem persists regarding the type locality of *A. villosa*. On the holotype is read: "Rio Grande, Tweedie, 1837." In his original diagnosis, Bentham (1841: 159) writes: *"Ad Rio Grande, Brasiliae Meridionalis, Tweedie."* Later, Bentham himself (1859: 87) adds: *"copioso in arena ad oras flum. Rio Grande et Uruguay: Tweedie,"* indicating its existence in two places: on the Uruguay River and in Río Grande.

It is very probable that Tweedie's collection was made only on the banks of the Río Uruguay, on the western limit of the state of Rio Grande do Sul. According to Castellanos (1945: 6), Tweedie embarked from Buenos Aires in 1832 in search of plants, ascended the Río Uruguay and continued on to Rio Grande do Sul, Santa Catarina and Rio de Janeiro, returning from there to his point of departure. Three years later he attempted a second expedition to Rio Grande, but upon leaving Montevideo the boat on which he traveled was shipwrecked.

All of the material studied by us was collected in sandy places on the banks of the Río Uruguay, from Paso de los Libres to the river's mouth, and along the Uruguayan coast

of the Río de la Plata, which supports the supposition that the holotype had been collected at some point along the Río Uruguay.

According to information supplied by Valls, in 1831 the southern boundary of the Brazilian state of Rio Grande do Sul used to be the Arapeí River, thereby including within the municipality of Alegrete the entire department of Artigas and part of the department of Salto, both of which currently pertain to Uruguay (Trindade 1985: 148 map and 176).

Therefore, it is possible that Tweedie had collected the type of *A. villosa* on the banks of the Uruguay River, between the mouth of the Arapey River (department of Salto) and Bella Union (department of Artigas), in present-day Uruguay.

Obs. 2. In the Museum of Paris (P) there is a specimen labeled "Brasil: Rio Grande, 1833, Guadichaud 883," a specimen actually collected by Sello in Uruguay. One proof of this is the existence of the specimen "Montevideo, Sello d.883" (K).

Obs. 3. *Arachis villosa* crossed only with other species of section *Arachis*. With *A. Batizocoi* it produced highly sterile hybrids, with 2.9% stained pollen. Hybrids of more than 20% stained pollen were obtained with *A. stenosperma*, *A. Diogoi*, *A. duranensis* and *A. monticola,* and with 70 to 73% stained pollen with *A. Cardenasii* and *A. correntina*. *Arachis villosa* also produces hybrids with *A. hypogaea* var. *fastigiata.*

62. *Arachis helodes* Martius ex Krapov. & Rigoni

Figs. 3,62; 28,C-D

Krapovickas & Rigoni, Darwiniana 11(3): 451-452, lám. 2, 1957.

Perennial plant. Taproot deep, without enlargements. Mainstem erect, ca. 5 cm long, without flowers; lateral branches procumbent, ca. 50 cm long. Stem glabrescent, somewhat villous and angular in the young parts; internodes 10-30 mm long. Leaves tetrafoliolate. On the mainstem, the fused portion of the stipules up to 9 mm long and the free parts up to 15 mm long; petiole up to 43 mm long; rachis up to 13 mm long; leaflets oval to lanceolate, the apical pair up to 34 mm long x 13 mm wide, the basal pair up to 30 mm long x 10 mm wide. On the lateral branches, the fused portion of the stipules up to 5 mm long, the free portion up to 13 mm long; petiole up to 10 mm long; rachis up to 6 mm long; leaflets obovate to suborbicular, the apical pair usually 11 mm long x 8 mm wide (up to 17 x 15 mm), the basal pair 10 mm long x 7 mm wide (up to 16 x 12 mm). Stipules glabrous, free ends subfalcate, with the margin somewhat ciliate; petiole and rachis canaliculate, glabrescent, with villous back when young; leaflets with both surfaces glabrous, upper side smooth, lower side with midvein and margin somewhat marked, margin sometimes with the occasional short bristle. Flowers along the length of the lateral branches in short 4-5-flowered spikes. Hypanthium 30-75 mm long, villous. Calyx bilabiate, villous and with scattered bristles, upper lobe broad, 4-toothed, 5-6.5 mm long; lower lobe thin, falcate, ca. 7 mm long. Standard up to 15 mm long x 16 mm wide, commonly orange with a yellow center, but can also be completely yellow; wings up to 10 mm long, yellow. Fruit subterranean, biarticulate; peg glabrous, 5-8 cm long; articles 8-12 mm long x 5-7 mm wide, with marked beak, pericarp fragile, somewhat reticulate. 2n=20 chromosomes (Smartt 1964, Smartt & Gregory 1967, GKP 9926).

Holotype: BRAZIL. Mato Grosso. *In palustribus ad Cuyabá, 1839, leg. S. Manso, Martii Herbar. Florae Brasil 588* (G!). Isotypes: NY!, P!.

Selected additional material: BRAZIL. **Mato Grosso.** Cuiabá, 8-III-1946, Burkart 15715 (CTES, SI); id., 15-III-1948, Stephens 262 (NA); id., Stephens & al. 256 (LIL, NA); id., 13-III-1959, Gregory & al. 9926 (CTES, G, GH, LIL, MO, NY, SI, SP, US). Mun. Poconé: Cotia, rio Bento Gomes, 60 km SW de Cuiabá, camino a Poconé, 16-XII-1976, Krapovickas & al. 30029 (CEN, CTES, GH, MO, NY, US). Mun. Cáceres: fazenda Sangradouro, 57°15'W, 16°S, 16-XII-1976, Krapovickas & al. 30031 (CEN, CTES, GH, LIL, MO, NY, SP, US); 101 km de

Cáceres, camino a Cuiabá, 17-XII-1976, Krapovickas & al. 30036 (CEN, CTES, GH, LIL, MO, NY, RB, US); Santo Antonio de Leverger, 20-VIII-1981, Valls & al. 6325 (CEN, CTES); id., Valls & al. 6326 (CEN, CTES); id., 24-I-1989, Valls & al. 12083 (CEN, CTES); BR-070, km 660, 1,2 km W do ribeirao Flexas, 30-V-1985, Valls & al. 8934 (CEN, CTES); 13 km S of Poconé, 21-VIII-1981, Valls & al. 6331 (CEN, CTES). Mun. N. Sra. do Livramento: 4-XI-1986, Valls & al. 10470 (CEN, CTES); id., Valls & al. 10471 (CEN, CTES); id., Valls & al. 10476 (CEN, CTES); 25,3 km da BR-070 camino a Poconé, 22-X-1985, Valls & al. 9318 (CEN, CTES).

Geographic distribution. The range of this species is rather limited in that it extends only some 100 km to the west and some 60 km to the south of Cuiabá, Mato Grosso (Brazil). It grows in open places subject to flooding.

Obs. *Arachis helodes* is very uniform with respect to the shape of the leaflets, which are always glabrous. Nevertheless, it shows a certain amount of polymorphism. The population Krapovickas & al. 30030 had individuals with orange flowers and individuals with yellow flowers. In the population Krapovickas & al. 30029, most of the plants had orange standards, but about 1% had yellow flowers and 1% had white flowers.

63. *Arachis correntina* (Burkart) Krapov. & W.C. Gregory *nov. comb.*

Figs. 3,63; 28,E-F

A. villosa Benth. var. *correntina* Burkart, Darwiniana 3(2): 269, 1939. Krapovickas & Rigoni, Rev. Invest. Agríc. 5(3): 289-293 (2n=20), 1951. Conagin, Bragantia 21(21): 357, est. 10, figs. 7B, 17, 1962. Conagin, Bragantia 18(5): 51-70, figs. 1-5, 1959.

A. correntina (Burkart) Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 97, 1973, *nomen nudum*.

Perennial plant. Taproot deep, 5-15 mm in diameter. Mainstem erect 10-25 cm long, lateral branches prostrate, up to 1 m long. In mature plants, the branches are usually covered with soil toward the base of the plant and weak adventitious roots are frequently found on the buried parts. Stems villous, occasionally with some bristles; internodes 15-35 mm long, angular when young, later cylindrical. Leaves tetrafoliolate. On the mainstem, the fused porton of the stipules 6 mm long, the free portion up to 20 mm long x 3 mm wide, triangular; petiole up to 45 mm long; rachis 12 mm long; leaflets elliptical-lanceolate, the apical pair up to 39 mm long x 15 mm wide, the basal pair up to 36 mm x 14 mm. On the lateral branches, the fused portion of the stipules 4-7 mm long, the free portion 7-10 mm long x 2-3 mm wide, triangular; petiole usually 5-10 mm long, up to 20 mm; rachis 3-7 mm long; leaflets elliptical to obovate, the apical pair commonly 12 mm long x 10 mm wide, up to 23 x 11 mm, the basal pair some 11 mm long x 9 mm wide, up to 20 x 9 mm. Stipules somewhat villous toward the base with glabrous surfaces and the margin ciliate; on the surfaces of the fused portion there are frequently long rigid bristles present. Petiole and rachis canaliculate, back villous with long silky hairs and short, more or less adpressed hairs, with bristles frequently present; canal with short scattered hairs. Pulvinus densely villous. Upper surface of the leaflets smooth, sometimes glabrous, or with variable hairiness, from short scattered hairs to more or less dense short hairs; lower surface with prominent midvein and margins, the surface with short adpressed hairs or with more or less raised hairs, on the midvein, more or less dense hairs 2 mm long, which may be present on the rest of the surface as well; margin with two kinds of trichomes: short, whitish, more or less adpressed hairs, long (1-2 mm) yellowish curved hairs, or some perpendicular, and short scattered bristles. Flowers along the length of the lateral branches in short, 3-4-flowered spikes. Hypanthium 6-11 cm long, villous. Calyx villous and with thin scattered bristles, lower lobe falcate, 6-8 mm long, upper lobe 5-7 mm long; standard orange, 18-23 mm wide x 11-16 mm long, wings yellow or yellow with the upper half orange. Fruit biarticulate; peg 5-10 cm long, somewhat villous near the base, later glabrous; isthmus 3-4 cm long; articles 8-13 mm long x 5-7 mm wide, smooth, beaked,

covered with dense diminutive hairs. 2n=20 chromosomes (Krapovickas & Rigoni 1949, 1951).

Holotype: ARGENTINA. Corrientes, dep. Capital, camino de Corrientes a San Cosme, entre km 10 y 11, muy abundante, flores amarillas, 21-XII-1935, Clos 5930 (BAB 59065!).

Selected additional material: ARGENTINA. **Corrientes.** Corrientes, XI-1921, G.T. Bertoni s/n (LPS 23125). Dep. Capital: en césped de plaza, XII-1975, Martínez Crovetto 10137 (CTES); matadero ayo. Pirayuí, 8-I-1966, Krapovickas & al. 11905 (CTES, US); ayo. Riachuelo, puente Pesoa, 2-III-1953, Krapovickas 7830 (CTES, LIL, MO, NY, US); ayo. Riachuelo y ruta 12, 23-I-1959, Gregory & al. 9530 (GH, LIL, MO, NY, SI, SP, US); id., Gregory & al. 9531 (GH, LIL, MO, NY, SI, US); ruta Prov. 5,4 km E de ruta 12, camino a Laguna Brava, 14-I-1966, Krapovickas & al. 11919 (CTES, NY, US); 1 km W de Laguna Brava, 28-XII-1976, Krapovickas & al. 30048 (CTES, US); entre Laguna Brava y ruta 12, 28-XII-1976, Krapovickas & al. 30049 (CTES); ruta 12, 4 km NE del aeropuerto "Cambá Punta", 28-XII-1976, Krapovickas & al. 30050 (CTES); id., 31-III-1980, Krapovickas & al. 36000 (CTES, GH, NY, US); id., Krapovickas & al. 36001 (CTES, MO, NY, US). Dep. San Cosme: between San Cosme and Ramada Paso, 9-XII-1947, Stephens & al. SH 16 (LIL); ruta 12, acceso a Paso de la Patria, 12-IV-1964, Krapovickas & al. 11350 (C, CTES, G. F, MO, P, SI). Dep. Itatí: Ramada Paso, 24-I-1959, Gregory & al. 9548 (GH, LIL, MO, NY, SI, SP, US); ruta 12, km 995, 24-I-1959, Gregory & al. 9549 (LIL, US); ruta 12, km 1015, 24-I-1959, Gregory & al. 9551 (LIL, US); ruta 12, 4 km E del acceso a Itatí, 23-I-1972, Krapovickas & al. 20797 (C, CEN, CTES, F, G, K, MBM, MO, SI, UC); ruta 12, 15 km del acceso a Itatí, 23-I-1972, Krapovickas & al. 20854 (BAB, CEN, CTES, F, G, LIL, LPB, MEXU, RB, SI, UC); ruta 12 a 5 km de Yacaré, 23-X-1957, Sayago 2933 (SI). Dep. San Luís del Palmar: ayo. Riachuelo, 7 km SE de San Luís del Palmar, 14-I-1966, Krapovickas & al. 11941 (CTES, UC, US); San Luís del Palmar, Luisa A. Loma, 4-XI-1968, Krapovickas 14488 (BAA, CTES, F, G, K); San Luís Del Palmar, 28-X-1969, Burkart 27595 (CTES, SI). Dep. San Miguel: Loreto, 25-I-1959, Gregory & al. 9557 (LIL, US); id., Gregory & al. 9558 (US); 12 km N de Loreto, 8-III-1974, Schinini 8370 (CTES, G). Dep. Ituzaingó: ruta 12, km 1134, entre Itá Ibaté e Ituzaingó, 5-III-1953, Krapovickas 7890 (CTES, LIL, US); 10 km W de Ituzaingó, 5-III-1953, Krapovickas 7897 (C, CTES, F, G, LIL, UC, US); Ituzaingó, I-1947, Spegazzini 10071 (BAB, SI); ayo. Las Casuarinas, 8-XII-1946, Pierotti 6208 (LIL); 30 km W de Ituzaingó, 16-I-1970, Krapovickas & al. 15680 (CTES, K, MO, P, SI); Villa Olivari, 18 km W de Ituzaingó, 2-X-1978, Schinini & al. 15669 (CTES, UC, US); Estancia San Pedro, 56°52'W, 27°45'S, 10-XI-1976, Arbo 1088 (CTES, G, K, US). Dep. Berón de Astrada: Campo Yaguá Cuá, 24-IV-1960, Pedersen 5550 (K, US, Herb. Pedersen). Dep. Concepción: Médano el Carmen, 6-I-1960, Pedersen 5326 (K, US, Herb. Pedersen); Ea. San Justo del Palmar, 8-III-1967, Pedersen 8084 (CTES, Herb. Pedersen); Tabay, 7-X-1973, Schinini 7453 (CTES); El Batel, Paso Crucecita, 11-II-1968, Krapovickas & al. 13800 (CTES, MO); 6 km E de Santa Rosa, estancia Millán, 27-III-1975, Arbo 839 (CTES); ruta 17, 9 km NE de Santa Rosa, 30-III-1974, Krapovickas & al. 24580 (CTES, G, UC); entre Santa Rosa y el río Santa Lucía, 5-II-1968, Krapovickas & al. 13780 (CEN, CTES, F, US); 11 km NW de Santa Rosa, 16-XII-1977, Tressens 1023 (CTES, G, NY). Dep. Mburucuyá: 32 km E de Saladas, estancia Pindapoy, 26-XI-1970, Carnevali 2271 (CTES); Loma Alta, 4-I-1962, Pedersen 6420 (K, US, Herb. Pedersen); 10 km W de Mburucuyá, 5-II-1968, Krapovickas & al. 13782 (CTES, G). Dep. Lavalle: Punta del Rubio, Anzótegui 1210 (CTES, SI, US).

PARAGUAY. **Central.** Cerro Peró, entre Ipacarai and Pirayú, 10-II-1966, Krapovickas & al. 12593 (CEN, CTES, G, MO, NY, P, SI, US); id., 16-VI-1977, Krapovickas & al. 30108 (CTES, F, G, GH, K, LIL, MO, NY, UC, US). **Presidente Hayes.** Villa Hayes, 4 km W del río Paraguay, 13-XII-1979, Schinini 19616 (C, CTES, F, G, LIL, MO, NY, P, UC, US); ruta Trans-Chaco, entre B. Aceval y Villa Hayes, 18-V-1981, Krapovickas & al. 37459 (CTES, G, IPA, MO, SI).

Cultivated material: ARGENTINA. **Córdoba.** Manfredi, 13-V-1950, Krapovickas 7201 (CTES), (proc.: Corrientes, entre Itatí y Tuyutí, leg. Báez y Rigoni). U.S.A. **Georgia.** Tifton, PI 262135, PI 258943, Hammons & al. Tifton Acc. A-28, 2-XI-1979 (CTES), proc. Argentina, Corrientes, ruta 12, río Empedrado, leg. Clos & Nieva, 21-VI-1947, D.E.I.P. 6519.

Geographic distribution. This species occurs

in the northwestern part of the province of Corrientes (Argentina), in deep sandy soils. Very similar plants were found in the proximity of Asunción (Paraguay) near Ipacaray, to the east of the Paraguay River and in the neighborhood of Villa Hayes, to the west of said river. In this last place it grows in fine sandy soils, on small hills of red soil with rocky outcrops.

Obs. 1. *Arachis correntina* is very close to *A. villosa* Benth., from which it is distinguished principally by its smooth fruit and the lightly marked margins of its leaflets. In *A. villosa* the articles of the fruit show a very marked reticulum, similar to that of *A. hypogaea*.

The type specimen has leaflets with the upper surface completely glabrous, but in material collected in the type locality, at 10 km NE of Corrientes and 4 km NE of the airport (Krapovickas & al. 30050, 36000 and 36001), the young leaves have short hairs scattered on the upper surface. None of these specimens has bristles on the stipules, but in the material that grows in the vicinity of the type locality, the presence of bristles is variable.

Obs. 2. *Arachis correntina* was one of the parents used in the first interspecific hybrid obtained in the genus *Arachis*, producing an F_1 triploid upon crossing it with *A. hypogaea* var. *fastigiata* (Krapovickas & Rigoni 1949, 1951).

Arachis correntina only produces hybrids when crossed with species of section *Arachis*. When crossed with the annual species, it produced highly sterile hybrids with *A. Batizocoi*, and hybrids of greater fertility with *A. stenosperma* (37.6%) and with *A. duranensis* (54.3%). It also produced hybrids with the perennial species *A. Diogoi* (35.85%), *A. Cardenasii* (63.8%) and *A. villosa* (73.15%). (see pp. 197-198 and M.P. Gregory & W.C. Gregory 1979).

On the basis of cytogenetic studies, Murty and Jahnavi (1986) conclude that *A. correntina* also could have been one of the species that contributed the 'A' genome of *A. hypogaea*.

64. *Arachis Simpsonii* Krapov. & W.C. Gregory *nov. sp.*

Fig. 3,64

Herba perennis. Caulis villosus. Stipulae pilis brevibus, adpressis vestitae, margine ciliatae, illae foliorum apicalium setulosae. Foliola ovalia, mucronulata, epiphyllo pilis brevibus sparsim vestito, hypophyllo pilis ca. 1.5 mm longis, villoso, nervo medio et margine ciliato prominentibus. Hypanthium 45 mm longum, villosum. Calyx 6-7 mm longus, setulis nonnullis immixtis villosus. Vexillum suborbiculare, ca. 15 mm longum, aurantiacum. Fructus biarticulatus paxillo 7-20 cm longo, articulis 8-10 mm longis x 4-5 mm latis, apice recurvo, pericarpio laevi.

Holotype: BOLIVIA. Santa Cruz. Prov. Sandoval, 5 km SSW de San Matías (58°26'W, 16°21'S), cerca de una laguna, suelo de aréna, 16-IV-1980, Krapovickas, Simpson & Schinini 36009 (CTES). Isotypes: CEN, G, GH, K, LIL, LPB, MO, NY, P, SI, SP, US.

Perennial plant. Taproot thick, obconical, 10-15 mm in diameter. Branches procumbent, ca. 80 cm long, stem angular, villous with two kinds of hairs: long, ca. 1.5 mm long, easily falling off, and small, adpressed, more persistent hairs; internodes 2-5 cm long. Leaves tetrafoliolate. On the lateral branches, stipules with the fused portion 5-7 mm long, the free portion triangular, falcate, 15-20 mm long x 4 mm wide. Petiole 8-20 mm long; rachis 5-8 mm long. Leaflets oval, mucronulate, apical pair sometimes broad, 25 mm long x 16 mm wide, up to 36 x 13 mm; basal pair commonly 21 mm long x 12 mm wide, up to 28 x 12 mm. Stipules with 6-7 prominent veins, surfaces with small, adpressed, scattered hairs, villous toward the base and on the back of the fused portion, margins ciliate; toward the apex of the branches the stipules have few bristles on the fused portion. Petiole canaliculate, villous on the dorsal line and on the margins of the canal, the remainder with scattered adpressed hairs, canal with some small adpressed hairs. Rachis narrow toward the base, with pubescence similar to that of the petiole; pulvinus villous. Leaflets villous; upper surface with short hairs,

uniformly scattered, margin prominent; lower surface villous, hairs ca. 1.5 mm long, midvein and marginal veins very prominent; margin ciliate. Flowers along the length of the branches, in very short few-flowered spikes. Hypanthium 45 mm long, villous. Calyx bilabiate, villous and with some bristles; upper lobe 6 mm long, lower lobe 7 mm long, subfalcate. Standard suborbicular, ca. 15 mm long, orange. Fruit subterranean, biarticulate; peg 7-20 cm long, villous on the aerial part; articles 8-10 mm long x 4-5 mm wide, smooth, with beak, covered with a dense coat of diminutive hairs. Seeá ca. 7 mm long.

Additional material: BOLIVIA. **Santa Cruz.** Prov. Sandoval: at north edge of San Matías, on road to San Francisco, 24-VIII-1981, Valls & al. 6346 (CEN, CTES). BRAZIL. **Mato Grosso.** Campo cerrado at km 135 on the road from Cáceres to S of Sierra do Aguapei, 4-III-1977, Kirkbride & al. 3042 (INPA, US).

Related material: BRAZIL. **Mato Grosso.** Mun. Cáceres: 23 km da BR-174, camino P. Esperidião a Casalvasco, 28-V-1985, Valls & al. 8896 (CEN, CTES); Estancia Villa Isabel (Posto e Rest. Serrano), km 55 da MT-265 (camino de Porto Esperidião a Casalvasco), 28-V-1985, Valls & al. 8900 (CEN).

Geographic distribution. This species inhabits the border area between Santa Cruz (Bolivia) and Mato Grosso (Brazil). In addition to the type collection, a herbarium specimen was also made in the Sierra do Aguapei, located some 90 km WNW of San Matías. It grows in the "cerrado," which is the type of vegetation called "pampa" in northeastern Bolivia.

Obs. 1. The specimen Kirkbride & Lleras 3042 is very similar to the type, but has a greater number of bristles on the stipules, which are also found on the petiole and on the rest of the rachis. It also has some bristles on the margin of the leaflets. In the type specimen, very few bristles are found on the stipules of the apical leaves.

The specimens Valls & al. 8896 and 8900 resemble *A. Simpsonii* in the shape of the leaves and in the tomentum, but they are distinguished for having fruits with articles from 7 to 8 mm long x 5 mm wide, with a reticulate pericarp. These reticulate articles are reminiscent of those of *A. villosa*, but are much smaller.

Obs. 2. *Arachis Simpsonii* is similar to *A. villosa,* from which it is distinguished by its larger leaves and because in *A. villosa* the fruit articles are larger and noticeably reticulate (Fig. 3, 62 and 65). Both species have villous upper surfaces of the leaflets.

Due to the presence of hairs on the upper side of the leaflets, it can also be compared to *A. Diogoi*; but in the latter the leaflets are much narrower, with differently colored upper and lower surfaces and the margins almost unmarked.

We dedicate this species to Dr. Charles E. Simpson with whom we collected the type specimen.

65. *Arachis Cardenasii* Krapov. & W.C. Gregory *nov. sp.*

Fig. 3,65

Arachis Cardenasii Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 98, 1973, *nomen nudem*. This refers to the speimen GKP 10017.

Herba perennis.[8] *Caulis angulosus, villosus, fere violaceus. Stipulae basi villosae. Folia caulis principalis foliolis ovalibus vel subobovatis, illa ramorum foliolis suborbicularibus usque obovatis, epiphyllo laevi, glabro, hypophyllo pilis adpressis vix conspicuis vestito, nervo medio pilis ca. 2 mm longis gerente prominente, folia juniora subtus longe pilosa, margine paulo manifesto longe ciliato parcius setuloso. Hypanthium 2-6 cm longum, villosum. Calyx 6-8 mm longus, pilis longis setulisque vestitus. Vexillum aurantiacum, raro luteum, 10-14 mm longum x 12-16 mm latum. Fructus biarticulatus paxillo 10-15 cm longo, isthmus 3 cm longus, articuli laeves, 7-11 mm longi x 4-6 mm lati, pericarpio tenui.*

Holotype: BOLIVIA. Santa Cruz. Prov. Chiqui-

[8]Error in original, appeared as *annua*.

tos, 2 km SW de Roboré, ca. 300 m del río Urasibiqui, 21-IV-1980, Krapovickas, Simpson & Schinini 36015 (CTES). Isotypes: CEN, G, GH, K, LIL, LPB, MO, NY, P, SI, SP, US.

Perennial plant. Taproot deep, without enlargements. Mainstem erect, 10-90 cm long, with long branches usually on the basal 10 cm, later continuing with very short vegetative branches and reproductive branches. Lateral branches procumbent, ca. 60 cm long, but up to 1.2 m long, with the base partially buried in the soil; stem angular, villous, hairs ca. 2 mm long, internodes 3-4 cm long, usually violaceous. Leaves tetrafoliolate. On the mainstem, stipules with the fused portion 10-13 mm long, the free tips 20-30 mm long x 3 mm wide; petiole 40-45 mm long; rachis 10-12 mm long; leaflets oval or somewhat obovate, the apical pair up to 55 mm long x 28 mm wide, the basal pair up to 46 mm long x 21 mm wide. On the lateral branches, stipules with the fused portion 5-7 mm long, the free tips 12-17 mm long x 3 mm wide; petiole 5-12 mm long; the rachis 5-7 mm long; leaflets suborbicular or obovate, obtuse, apical pair up to 35 mm long x 25 mm wide, the basal pair up to 32 mm long x 22 mm wide. Stipules villous toward the base, with subglabrous surfaces, usually with some adpressed hairs on the surface of the fused portion and with a line of long hairs on each of the two lateral veins on the back; the free portion acute, with ciliate margin. Petiole and rachis canaliculate, the back with short adpressed hairs and scattered hairs ca. 2 mm long, margins of the canal ciliate; pulvinus villous. Leaflets with the upper surface glabrous, smooth, with the margin little-marked; lower surface with some barely visible adpressed hairs, midvein prominent, with hairs ca. 2 mm long, frequently also with sparse long hairs on the rest of the lower surface of young leaves; margin longly ciliate and with some bristles. Axillary spikes very short, 5-flowered, bracts with long hairs on the veins. Hypanthium 2-6 cm long, pilose. Calyx bilabiate, covered with long hairs and with bristles, upper lobe 4-dentate, 6-8 mm long, lower lobe falcate, 7-9 mm long. Standard orange, rarely yellow, 10-14 mm long x 12-16 mm wide; wings yellow, 7-10 mm long. Ovary bi-ovulate. Fruit biarticulate; peg glabrous on the aerial part, 10-15 cm long; isthmus 3 cm long; articles 7-11 mm long x 4-6 mm wide, beak somewhat developed, pericarp thin, smooth, with short hairs that retain a thin layer of soil. 2n=20 chromosomes (Smartt 1964, Smartt & Gregory 1967, GKP 10017).

Additional material: BOLIVIA. **Santa Cruz.** Prov. Chiquitos: Roboré, X-1934. Cárdenas 2988 (G); id., 8-II-1959, Meyer 20287 (LIL); id., 31-III-1959, Gregory & al. 10017 (LIL, MO, NY, US); id., 1-IV-1959, Gregory & al. 10026 (CTES, GH, LIL, MO, NY, SI, SP, US); id., 21-IV-1980, Krapovickas & al. 36016 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, US); id., 22-IV-1980, Krapovickas & al. 36017 (CEN, CTES, G, GH, LPB, MO, NY, US); id., Krapovickas & al. 36018 (CEN, CTES, LPB, NY, US); id., Krapovickas & al. 36019 (CEN, CTES, LPB, GH, K, MO, NY, US); 24-IV-1980, Krapovickas & al. 36022 (CEN, CTES, LPB, NY, US); id., Krapovickas & al. 36023 (CEN, CTES, G, GH, LPB, MO, NY, US); Roboré, 21-XI-1989, Nee 37826 (CTES); 6 km de Roboré, camino a Santiago, 23-IV-1980, Krapovickas & al. 36020 (CEN, CTES, GH, LPB, MO, NY, P, SI, US); Santiago, 12-II-1958, Krapovickas 9412 (CTES, LIL); id., 23-IV-1080, Krapovickas & al. 36021 (CEN, CTES, G, GH, K, LPB, MO, NY, P, US); Santiago de Chiquitos, 23-XI-1989, Nee 37846 (CTES); 15 km S de San José, camino a Natividad, 29-IV-1980, Krapovickas & al. 36032 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, SI, US); 17 km S de San José, 20-IV-1980, Krapovickas & al. 36033 (CEN, CTES, G, LPB, MO, NY, US); 21 km SSW de San José, 29-IV-1980, Krapovickas & al. 36034 (CEN, CTES, G, GH, LIL, LPB, MO, NY, US); 2 km W de Natividad, 29-IV-1980, Krapovickas & al. 36035 (CEN, CTES, K, LPB, K, MO, NY, P, US). Prov. Sandoval: San Matías, 58°26'W, 16°21'S, 20-IV-1980, Krapovickas & al. 36011 (CTES); id., Krapovickas & al. 36013 (CTES).

PARAGUAY. **Alto Paraguay** (ex Chaco). Mayor Pedro Lagerenza, 60°45'W, 20°5'S, río Timane, 5-IV-1978, Schinini & al. 15219 B (CTES, G, MO, SI, US) (see Obs. 2 in *A. duranensis*); Cerro León, 60°15'W, 20°26'S, laguna Tareyí, 26-VIII-1981, Schinini & al. 21198 (CTES).

Geographic distribution. This species is found in the department of Santa Cruz (Bolivia), mainly on the southern edge of the Chiquitana mountains. It was also collected in

San Matías, on the border with Mato Grosso (Brazil), and in the north of the Paraguayan "chaco." It grows in deep, sandy soils.

Obs. Smartt, Gregory & Gregory (1978a), based on cytogenetic studies, proposed *A. Cardenasii* and *A. Batizocoi* as the possible donors of the 'A' and 'B' genomes, respectively, of *A. hypogaea* and that this species could have originated from a sterile hybrid similar to that produced by said diploid species.

Arachis Cardenasii crossed only with species of its own section. It produced highly sterile hybrids with the annual taxa *A. Batizocoi*, *A. monticola*, *A. hypogaea* var. *hypogaea* and *A. hypogaea* var. *fastigiata*. Hybrids were obtained with more than 48% pollen stained with the annual species *A. stenosperma* and *A. duranensis* and with the perennial species *A. Diogoi*, and with even greater fertility with *A. correntina* (63.8%) and *A. villosa* (70.4%), also perennial (p. 198, and Gregory, M.P. & Gregory 1979).

Resslar & Gregory (1979) studied the meiosis of *A. Cardenasii*, *A. duranensis* and *A. villosa* and their hybrids, and concluded that these three species have a common genome, which they designated genome 'A.'

66. *Arachis Kempff-Mercadoi* Krapov., W.C. Gregory & C.E. Simpson *nov. sp.*

Figs. 3,66; 29

Herba perennis. Radix palaris. Caulis principalis erectus. Rami prostrati usque ad 1.20 m longi. Caulis pilis parvis adpressis cum pilis ca. 1.5 mm longis immixtis vestitus, aut fere glabro. Stipulae glabrae vel pilis nonnullis parvis, adpressis, margine majoribus vestitae. Folia caulis principalis foliolis lanceolatis, illa ramorum foliolis oblongis vel interdum obovatis. Epiphyllum laeve, villosum usque glabrum. Hypophyllum pilis parvis adpressis vestitum vel fere glabrum, margine et nervis paulo prespicuis, margine pilis plus minusve adpressis setulisque nonnullis brevibus instructo. Hypanthium 70-90 mm longum, villosum. Calyx 5 mm longus, villosus setulosusque. Vexillum 12 mm longum. Fructus subterraneus, biarticulatus, paxillo 13 cm longo, isthmo 4.5 cm longo, articulis 9-10 mm longis x 5-6 mm latis, pericarpio laevi.

Holotype: BOLIVIA. Dep. Santa Cruz. Prov. Gutierrez, 10 km W de Portachuelo (camino a Buena Vista), 63°24'W, 17°20'S, ca. 350 m s.m. Junto con *Paspalum notatum*, cerca de arroyo, también entre *Bromelia*, borde de bosque de *Cecropia, Cassia, Attalea, Psidium, Samanea* etc., 20-IV-1977, Krapovickas & al. 30085 (CTES). Isotypes: CEN, GH, K, LIL, LPB, MO, NY, US.

Perennial plant, with a strong and deep taproot, ca. 10 cm in diameter at the collar. Stem angular with small adpressed hairs and long hairs up to 1.5 mm long, aligned over the angles, or nearly glabrous. Lateral branches prostrate ca. 1.20 m long. Leaves tetrafoliolate. On the mainstem, stipules with the fused portion 14 mm long and the free portion 20 mm long; petiole 45-60 mm long; rachis 10-12 mm long; leaflets lanceolate, the distal ones 40-45 mm long x 14-17 mm wide, the basal ones 35-42 mm long x 12-15 mm wide. Leaves of the lateral branches: stipules with the base fused 4-10 mm long and the free tips 15-17 mm long x 3 mm wide, glabrous or with some small adpressed hairs, on the margin hairs somewhat larger, also adpressed; petiole 5-25 mm long; rachis 4-7 mm long; distal leaflets 20-35 mm long x 12-13 mm wide, basal leaflets 18-19 mm long x 10 mm wide, oblong, sometimes obovate, upper surface smooth, from villous to glabrous on the same branch, lower surface with small adpressed hairs or almost glabrous, margin and veins little marked, hairs more or less adpressed and some short bristles on the margin. Inflorescences short. Hypanthium 70-90 mm long, villous. Calyx 5 mm long, villous and with bristles. Standard 12 mm long x 15 mm wide, wings 8 mm long x 5 mm wide. Fruit subterranean, biarticulate; peg 13 cm long; isthmus 4.5 cm long; articles smooth, 9-10 mm long x 5-6 mm wide. Seed 6.5-8.5 mm long x 4-4.5 mm wide, testa uniformly tan, darker and browner in old seeds. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Additional material: BOLIVIA. **Santa Cruz.** Buena Vista, 20-I-1915, Steinbach 1000 (LIL); id., 11-XII-1920, Steinbach 5211 (NY); id., Steinbach 6673



Fig. 29. *Arachis Kempff-Mercadoi*: plant (K.30084).

(K); Santa Cruz, 22-VI-1965, Adolfo M. 443 (US). Prov. Gutierrez: orillas del río Piray, 8 km E de Portachuelo, 80 km N de Sta. Cruz, 63°18'W, 17°20'S, 20-IV-1977, Krapovickas & al. 30084 (CTES, GH, LPB, MO, NY, P, SI, SP, US); 13,1 km W de Portachuelo, camino a Buena Vista, 7-IV-1979, Krapovickas & al. 35003 (BAB, CEN, CTES, GH, LIL, LPB, MO, NY, US). Prov. Sara: 2 km ENE of Portachuelo, on highway to Montero, ca. 17°21'S, 63°17'W, 21-V-1991, Nee 40482 (CTES); camino a Nueva Moca, 2,5 km N de la ruta Portachuelo-Buena Vista, 10 km W de Portachuelo, 7-IV-1979, Krapovickas & al. 35002 (BAB, CTES, GH, LPB, MO, NY, SI, SP, US); cerca de Carandá, 20 km SW de Portachuelo, 7-IV-1979, Krapovickas & al. 35004 (CTES, GH, K, LIL, LPB, MO, NY, SP, US). Prov. Andrés Ibañez: near río Los Ajos, 0,5 km N of Terevinto, 17°43'S, 63°22'30"W, 30-XI-1988, Nee & al. 37008 (CTES); Carandá, 500 m, 25-IV-1966, Brooke 108 (K); between Portachuelo y Buena Vista, 14-III-1964, Badcock 19 (K).

Related material: BOLIVIA. **Santa Cruz.** Prov. Ñuflo de Chávez: Ascensión de Guarayos, 2-3 km al N camino a Centinela, 26-IV-1977, Krapovickas & al. 30086 (BAB, C, CEN, CTES, GH, LPB, MO, NY, US); id., aeropuerto, 27-IV-1977, Krapovickas & al. 30087 (CTES, NY, US); id., 3 km al S, arroyo San Joaquín, 27-IV-1977, Krapovickas & al. 30088 (CEN, CTES, GH, K, LPB, MO, NY, SI, US); id., 1 km al W, 27-IV-1977, Krapovickas & al. 30089 (CTES, G, GH, LIL, LPB, MO, NY, SP, US); borde sud de Ascensión de Guarayos, 28-IV-1977, Krapovickas & al. 30090 (CTES, GH, LPB, MO, NY, US); 2 km NE of Ascensión de Guarayos, 23-IX-1988, Williams 699 (CTES); 2 km N of Surucusí, on road to Ascensión de Guarayos before El Puente, 22-IX-1988, Williams 697 (CTES).

Cultivated material: BOLIVIA. **Santa Cruz.** Prov. Andrés Ibañez: Santa Cruz de la Sierra (procede del camino Buena Vista-Portachuelo), 20-IV-1977, Krapovickas & al. 30103 (CTES, NY, US); id., Krapovickas & al. 30104 (CTES, US); id., 24-IV-1977, Krapovickas & al. 30105 (CTES, NY, US); id., 6-IV-1979, Krapovickas & al. 35001 (CEN, CTES, G, GH, LIL, LPB, MO, NY, US); id., 23-II-1988, Williams 691 (CTES); id., Valls 13250 (CEN).

Geographic distribution. This species grows in the department of Santa Cruz, in Bolivia, a little to the north of the city of Santa Cruz de la Sierra, to the west of the Piray River, between Portachuelo and Buena Vista, in deep, sandy soils. It was also found in Ascensión de Guarayos, in the same department.

Obs. We dedicate this species to our lost friend, Noel Kempff Mercado, who promoted the cultivation of this species, for its colorful and prolonged flowering, in the parks and gardens of his native Santa Cruz de la Sierra.

67. *Arachis Diogoi* Hoehne

Fig. 3,67

Hoehne, Comm. lin. telegr. Bot. 8: 71-72, 1919. "Exempl. s.n. do Dr. Julio Cesar Diogo. Estampa n. 147. Colhida nas margens arenósas da bahia da Gahyba, em Matto Grosso; florescendo em Setembro."

A. villosa Benth. subsp. *Diogoi* (Hoehne) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 761, 1933.

A. chacoense Krapov. & W.C. Gregory, in W.C. Gregory, M.P. Gregory, Krapovickas, Smith & Yarbrough, in Peanuts—Culture and Uses: 73, 1973, *nomen nudum*. Name proposed for the specimen Gregory & Krapovickas 10602 from Puerto Casado, Paraguay.

Perennial plant. Taproot 5-10 mm in diameter, deep, without enlargements. Mainstem erect. Branches prostrate, somewhat decumbent, 30-60 cm long. Stem cylindrical, somewhat angular on the young parts, villous, at times with some bristles present; internodes 30-60 mm long. Leaves tetrafoliolate. Stipules with the fused portion 6-8 mm long, the free parts ca. 11 mm and up to 20 mm long. Petiole 12-17 mm long on lateral branches and up to 35 mm long on the mainstem. Rachis 5-8 mm long. Apical pair of leaflets commonly 26 mm long x 6 mm wide but up to 39 mm x 8 mm; basal pair commonly 22 mm x 5 mm but up to 30 mm x 7 mm. Stipules violet, with the fused portion almost smooth, the veins slightly marked, softly villous with short, dense, silky hairs; free portion narrowly triangular, 1.5 to 3 mm wide, acute, subfalcate, with veins somewhat prominent;

hairs short, adpressed, scattered; margin ciliate. Petiole and rachis canaliculate, canal and back pubescent, long hairs on the margins of the canal and on the dorsal line; pulvinus densely villous. Bristles occur frequently on the stipules, petiole and rachis. Leaflets from narrow lanceolate to oblong-lanceolate, acute, apiculate; upper side smooth, somewhat villous with short, more or less erect scattered hairs; underside villous, midrib and margins somewhat prominent, with violet tinge; margin ciliate and with some bristles. Flowers along the length of the branches in short 3-4-flowered spikes. Hypanthium 4.5-7 cm long, villous. Calyx bilabiate, densely villous, with long silky hairs and some bristles; upper lobe broad, 7 mm long, tridentate, lower lobe subfalcate, 8 mm long. Corolla frequently entirely yellow, occasionally with an orange standard; standard up to 16 mm long x 18 mm wide, wings up to 11 mm long. Fruit subterranean, biarticulate; peg ca. 15 cm long, aerial part villous, violet tinged; articles 10-11 mm long x 5-6 mm wide, with beak, pericarp reticulate. 2n=20 chromosomes (Smartt 1964; Smartt & Gregory 1967; GK 9901, 10602).

Holotype: BRAZIL. Mato Grosso do Sul. Margens da Lagoa Gahiba, IX-1908, Diogo 317 (R 4925!).

Selected additional material: BOLIVIA. **Santa Cruz.** Prov. Velazco: San Miguelito, 23 km N de San Ignacio, 8-V-1977, Krapovickas & al. 30101 (CTES, G, GH, LPB, MO, NY, SI, US); id., Krapovickas & al. 30102 (CEN, CTES, G, GH, K, LIL, LPB, MO, NY, SI, US).

BRAZIL. **Mato Grosso.** 70 km SE de Cuiabá, estrada Rondonopolis-Cuiabá, 9-III-1959, Gregory & al. 9901 (CTES, GH, LIL, MO, NY, SI, SP, US); 62 km SW of Cuiabá on road to Poconé, at rio Bento Gomes, 21-VIII-1981, Valls & al. 6330 (CEN, CTES). **Mato Grosso do Sul.** Porto Indio, orilla del canal Pedro II que une la lagoa Gaiba y la lagoa Uberaba, 57°55'W, 17°42'S, 6-XII-1976, Krapovickas & al. 30001 (CEN, CTES, G, GH, LPB, MO, NY, SI, US); Jaguaribe, orilla sud de Lago Gaiba, 57°40'W, 17°48'S, 6-XII-1976, Krapovickas & al. 30005 (CEN, CTES, GH, K, LIL, MO, NY, SP, US). Mun. Corumbá: 1 km W do Porto da Manga, na estrada para Corumbá, 12-X-1985, Valls & al. 9147 (CEN, CTES); id. Valls & al. 9148 (CEN).

PARAGUAY. **Alto Paraná.** Puerto Casado, I-1917, Rojas 2923 (LIL); id., Rojas 2928 (SI); id., 18-II-1948, Stephens & al. SH 115 (LIL, NY); id., 25-II-1950, Ramírez 630 (SI); id., 19-V-1961, Gregory & al. 10602 (CTES, GH, LIL, MO, NY, SI, US). **Paraguarí.** Arroyo Tebicuary y frente a Villa Florida, 15-II-1950, Rosengurtt B-5762 (CTES, MVFA, SI); id., 4-II-1966, Krapovickas & al. 12404 (CTES, G, NY, SI, SP, US); id., 16-VI-1977, Krapovickas & al. 30106 (CEN, CTES, F, GH, K, LIL, MO, NY, US).

Cultivated material: ARGENTINA. **Misiones.** Puerto Iguazú, cult., formando césped, procedente de Puerto Casado, 12-I-1972, Mroginski & al. 360 (CTES).

Geographic distribution. This species grows in the watershed of the Río Paraguay, from the shores of Lagoa Gaiba and the Pedro II canal which unites the former with Lagoa Uberaba, on the border of Mato Grosso do Sul with Bolivia, to Puerto Casado, in Paraguay. It is adapted to the Pantanal where it tolerates annual floods up to 3 m deep (Valls & al. 9147).

We ascribe to this species, with certain doubts, material collected in San Miguelito, near San Ignacio (Santa Cruz, Bolivia), a locality that while pertaining to the Amazon basin, is not very far from the headwaters of the Río Paraguay. By the same token, we included specimens collected between Cuiabá and Rondonópolis (MT) and others from as far south as the arroyo Tebicuary, in the department of Paraguarí (Paraguay).

Obs. 1. *Arachis Diogoi* presents certain polymorphisms that we do not find to be related to one another. In the two collections that we made at Lagoa Gaiba, the type locality, the majority of the plants had yellow flowers, and about 1% showed flowers with an orange standard.

On the other hand, all of the individuals observed from the collection from Pedro II canal (30001) had bristles on the stipules, petiole and rachis. The type specimen has not one bristle. In contrast, in the population from Jaguaribe (30005) there are individuals with bristles and individuals without them.

Obs. 2. The interpretation of *A. Diogoi* has had some problems that have led to confusion. It was described by Hoehne in 1919 and the type specimen was deposited in the Museo Nacional de Rio de Janeiro. Later, upon preparing his revision of the genus *Arachis* (1940), work done at the Instituto de Botánica de São Paulo, Hoehne was not able to reexamine the collections deposited in the Museo Nacional de Rio de Janeiro (Hoehne & Kuhlmann 1951: 230). Surely, it is owing to this circumstance that Hoehne would assign, in his monograph, this name to a different species from the area around Campo Grande (MGS), a species that we name *A. Archeri*. Both species have the form of the leaflets in common, but they differ in habit, prostrate in *A. Diogoi* and erect or decumbent in *A. Archeri*, in root system, with enlarged branchings in *A. Archeri*, and in the position of the flowers, along the length of the spreading stems in Hoehne's species and clustered around the base of the plant in the species from Campo Grande.

The name *A. Diogoi* appears repeatedly in the cytogenetics literature to designate plants cultivated at the Instituto Agronômico de Campinas (São Paulo, Brazil) according to the concept that Hoehne would develop in his monograph of 1940. In accordance with the criteria upon which we now support our determinations, the material designated V.85 is *A. major and* V.84 and V.128 are *A. Archeri* (Mendes 1947, Conagin 1962, Pompeu 1977).

In 1961, when we collected the specimen 10602 in Puerto Casado, on the Paraguay River, we found ourselves with a very different plant from the one that at that time was called *A. Diogoi* and that grows in the higher parts of the Sierra de Maracaju, near Campo Grande, in Mato Grosso do Sul. Thus, we gave this plant the name *A. chacoense*, mentioned in the literature beginning in 1973. Later, in 1976, we had the opportunity to collect the true *A. Diogoi* in the type locality of this species. The great similarity between collections 10602, 30001 and 30005, and their similar genetic behavior, induced us to treat all of these collections as pertaining to a single species.

Obs. 3. *Arachis Diogoi* has been crossed with species of section *Arachis*, producing very sterile hybrids with the annual taxa *A. Batizocoi*, *A. monticola*, *A. hypogaea* var. *hypogaea* and *A. hypogaea* var. *peruviana*, with more than 28.9% stained pollen with *A. villosa*, *A. correntina* and *A. Cardenasii*, and up to 88.5% with *A. stenosperma* (pp. 197-198 and Gregory, M.P. & Gregory 1979).

68. *Arachis Kuhlmannii* Krapov. & W.C. Gregory *nov. sp.*

Figs. 3,68; 30

Herba perennis. Radix palaris. Caulis pilis ca. 1.5 mm longis villosus usque glabrescens. Stipulae villosae basi setulosaeque, apicibus liberis glabrae, margine ciliatae. Caulis principalis erectus foliolis oblongo-lanceolatis. Rami procumbentes foliolis obovatis. Epiphyllum laeve, glabrum, hypophyllum glabrum vel in foliis novellis pilis parvissimis adpressis vestitum, margine haud incrassato ciliis setulisque nonnullis instructo. Hypanthium 20-60 mm longum, villosum. Calyx 6-7 mm longus, villosus setulosusque. Vexillum aurantiacum, raro luteum, 10 mm longum. Fructus subterraneus, biarticulatus, paxillo 8-12 cm longo, aliquanto villoso, isthmo 3 cm longo, articulis 10-14 mm longis x 5-6 mm latis, pericarpio subtiliter reticulato, fere laevi.

Holotype: BRAZIL. Mato Grosso. 70 km E de Cáceres, camino a Cuiabá, Serra de Araras, 16°08'S, 57°18'W, 200 m s.m., 17-XII-1976, Krapovickas & Gregory 30034 (CEN). Isotypes: CTES, G, GH, K, LIL, MO, NY, P, RB, SI, SP, US.

Perennial plant. Taproot, thick, up to 23 mm in diameter, deep, without enlarged branchings or tuberoids. Mainstem erect, 20-25 cm in height, without flowers, branched at the base, with internodes shorter than the stipules, villous on the younger parts. Lateral branches prostrate, up to 80 cm long, with few branches, but the secondary branches vegetative and with inflorescences along their length, internodes 3-6 cm long, from villous to glabrescent, with long hairs ca. 1.5 mm long. Leaves tetrafoliolate. On the mainstem, the fused base of the stipules 11-15 mm long, the free tips 25-30 mm long x 2-3 mm wide; the petiole 37-45 mm long; the rachis 10-16 mm

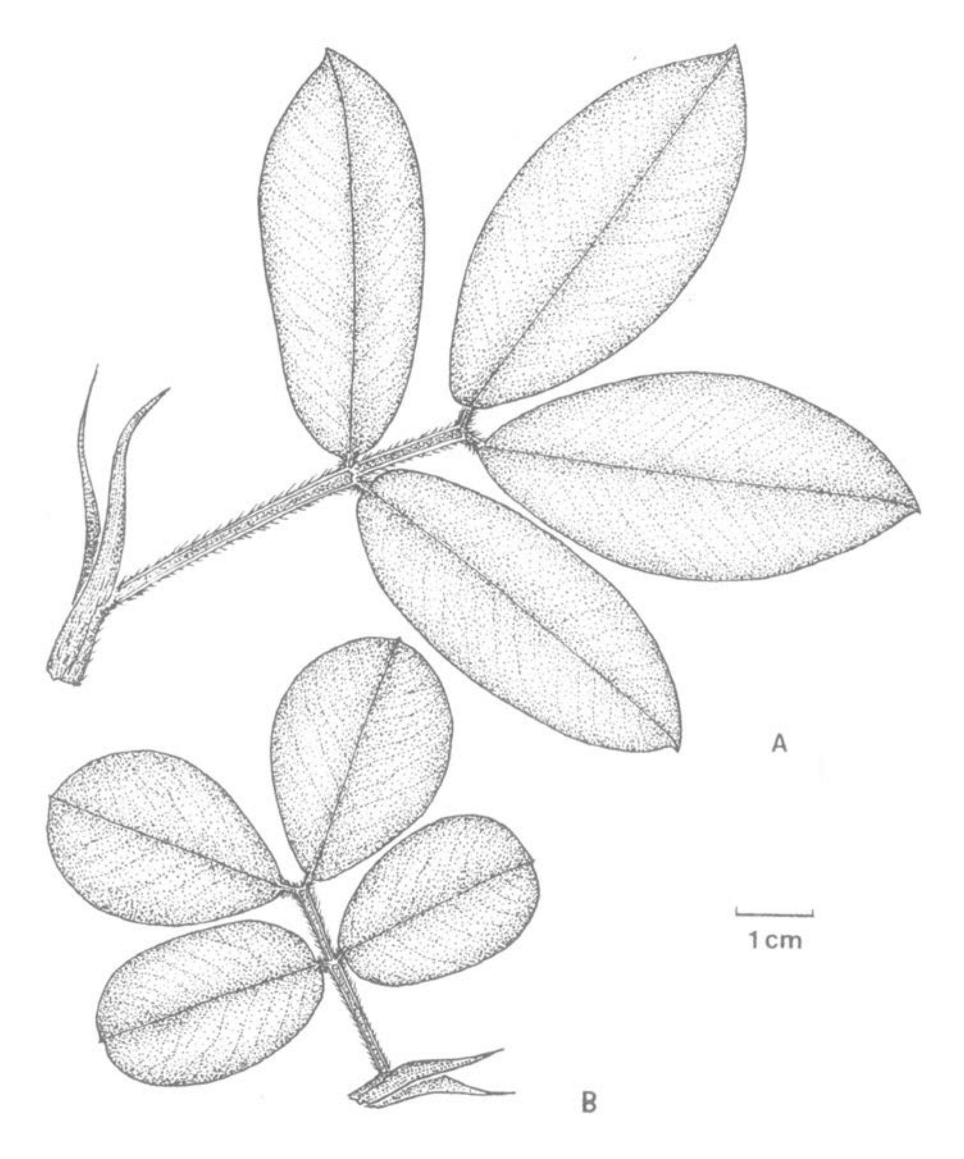


Fig. 30. *Arachis Kuhlmannii*: A, leaf from mainstem; B, leaf from lateral branch (K.30034).

long; the apical leaflets 40-60 mm long x 12-27 mm wide, the basal leaflets 37-54 mm long x 10-22 mm wide. Leaves on the lateral branches with the fused portion of the stipules 5-7 mm long, the free portion 13-25 mm long x 3-4 mm wide; the petiole 9-25 mm long; rachis 7-10 mm long; apical pair of leaflets 28-37 mm long x 13-23 mm wide, the basal pair 26-32 mm long x 11-21 mm wide. The stipules villous with bristles on the fused portion, the free portion with surfaces glabrous and margin ciliate, stipules of the mainstem usually more glabrous. Petiole villous or with a few long hairs, sometimes with bristles; on the leaves of the mainstem the petioles are more glabrous. Leaflets of the mainstem oblong-lanceolate, those of the lateral branches obovate, usually rounded, sometimes somewhat acute, upper leaf surface glabrous, lower leaf surface glabrous, in young leaves with very small adpressed hairs, margin not thickened, with cilia and some bristles. Inflorescences axillary, 4-5-flowered, axis short, shorter than the stipules. Hypanthium 20-60 mm long, villous. Calyx villous and with bristles, the wider lobe 6 mm long, the narrow lobe subfalcate, 7 mm

long. Standard orange, 10 mm long, wings and keel yellow; in some populations (30034) some flowers entirely yellow. Fruit biarticulate; pegs 8-12 mm long, somewhat villous on the aerial portion. At the beginning of its development, when the peg has not yet entered the soil, a zone of dense, adpressed hairs ca. 4 mm long appears some 2 mm back from the tip. 2n=20 chromosomes (Fernández & Krapovickas 1994).

Selected additional material: BRAZIL. **Mato Grosso.** Mun. Cáceres: 94 km de Cáceres camino a Cuiabá, 17-XII-1976; Krapovickas & al. 30035 (CEN, CTES, GH, K, MO, NY, RB, SI, US); Cáceres, cult. at the airport, 31-VIII-1981, Valls & al. 6410 (CEN, CTES); 1,1 km a NW da ponte do rio Paraguay a W de Cáceres na saída para Porto Velho (BR-354), 25-X-1985, Valls & al. 9375 (CEN, CTES); 47 km E de Cáceres, BR-174, km 680, 29-V-1985, Valls & al. 8916a (CEN, CTES); id., Valls & al. 8918 (CEN); 42 km E de Cáceres, BR-174, km 685, 30-V-1985, Valls & al. 8935a (CEN, CTES); 23,7 km alem do ribeirao Flexas, entre Cuiabá e Cáceres, restaurante Oasis, 24-X-1985, Valls & al. 9354 (CEN, CTES); id., Valls & al. 9355 (CEN, CTES); Faz. Santo André, 20 km SSW de Cáceres, camino a San Matias (Bolivia), 24-VIII-1981, Valls & al. 6344 (CEN, CTES); Caicara, 3 km N of road from Cáceres to Porto Esperidião (20 km NW of Cáceres), 25-VIII-1981, Valls & al. 6352 (CEN, CTES); 18,6 km NW de Cáceres, BR-174, 25-VIII-1981, Valls & al. 6355 (CEN, CTES); id., 18-V-1985, Valls & al. 8753 (CEN, CTES); 56 km NW de Porto Esperidião, BR-174, km 148,3, 30-VIII-1981, Valls & al. 6404 (CEN, CTES); id., 18-V-1985, Valls & al. 8763 & 8764 (CEN, CTES); id., 28-V-1985, Valls & al. 8887, 8888 & 8889 (CEN, CTES). Mun. N. Sra. do Livramento: río Piraim, 4-XI-1986, Valls & al. 10506 (CEN, CTES); id., Valls & al. 10507 (CEN). Mun. Poconé: Várzea Comprida, 10-II-1978, Allem & al. 1663 (US). **Mato Grosso do Sul.** Between Corumbá and Cuiabá, V-1927, Smith 107 (K). Mun. Aquidauana: Aquidauana, 27-II-1959, Gregory & al. 9824 (LIL); 25 km W de Aquidauana, BR-262, 12-XII-1976, Krapovickas & al. 30017 (CEN, CTES, G, GH, K, MO, NY, P, SI, SP, US); 12 km W do trevo de acesso a Aquidauana, BR-262, 7-IV-1986, Valls & al. 9912 (CEN, CTES); id., 30-X-1986, Valls & al. 10405 (CEN, CTES); Faz. Rio Negro, 30-X-1978, Allem & al. 2269 (CEN, CTES); 14,3 km NE da Faz. Proteçao na estrada Rio Negro-Aquidauana, 29-X-1985, Valls & al. 9470 (CEN, CTES); 2,2 km NE da Faz. Pontal e 24 km NE do rio Taboco, estrada Rio Negro-Aquidauana, 29-X-1985, Valls & al. 9479 (CEN, CTES); id., 30-X-1986, Valls & al. 10420 (CEN); Faz Rancharia, 20°02'S, 55°57'W, 24-XI-1989, Pott & al. 5451 (CTES). Mun. Corumbá: Faz. Nhu Mirim, Pantanal de Nhecolandia, 4-X-1976, Allem 120 (CEN); Faz Nhu Mirim, 150 km E de Corumbá, 7-XII-1976, Krapovickas & al. 30008 (CEN, CTES, G, GH, K, LIL, MO, NY, SP, US); id., 17-X-1985, Valls & al. 9230 & 9231 (CEN, CTES); Faz. Guanandi, 18°52'S, 56°11'W, 18-X-1985, Valls & al. 9235 & 9236 (CEN, CTES); 11 km da Faz. Guanandi na trilha para Nhu Mirim, 19-X-1985, Valls & al. 9243 (CEN, CTES); Faz Ipanema, 19°04'S, 56°32'W, 17-X-1985, Valls & al. 9214 (CEN, CTES). Mun. Miranda: Miranda, campo de futebol, 19-IV-1984, Valls & al. 7639 (CEN, CTES); id., 5-IV-1986, Valls & al. 9894 (CEN, CTES); inicio da rodovia Miranda-Bonito, 6-IV-1986, Valls & al. 9896 (CEN, CTES).

Related material: BRAZIL. **Mato Grosso.** Pe de Anta, 20 km NW of Cáceres on road to Porto Esperidião, 25-VIII-1981, Valls & al. 6351 (CEN, CTES); Vila Bela, 27-VIII-1981, Valls & al. 6380 (CEN, CTES); 71 km S of Vila Bela, 27-VIII-1981, Valls & al. 6389 (CEN); 75 km S of Vila Bela, 27-VIII-1981, Valls & al. 6390 (CEN); Casalvasco, 29-VIII-1981, Valls & al. 6396 (CEN, CTES). Mun. Cáceres: 9 km ENE de Porto Esperidião (BR-174, km 91,9), 30-VIII-1981, Valls & al. 6408b (CEN); 18-V-1985, Valls & al. 8758 (CEN, CTES); 45 km N of Cáceres, on road to Barra do Bugres, 31-VIII-1981, Valls & al. 6413 (CEN, CTES); id., 31-V-1985, Valls & al. 8964 (CEN, CTES); 57 km S de Barra do Bugres, camino a Cáceres, 1-VI-1985, Valls & al. 8979 (CEN, CTES); 73 km S de Barra do Bugres, camino a Cáceres, 1-VI-1985, Valls & al. 8980 (CEN, CTES); 55,1 km NE de Cáceres, na estrada para Barra do Bugres, 26-I-1985, Valls & al. 9394 & 9395 (CEN, CTES).

Common name. "amendoim bravo" (Allem & al. 1663).

Geographic distribution. *Arachis Kuhlmannii* grows in the northern and southern edges of the Pantanal Matogrossense, in the states of Mato Grosso and Mato Grosso do Sul (Brazil) and is one of the few species collected in the very center of the Pantanal (Pantanal da Nhecolandia).

Obs. 1. The specimen Krapovickas & al.

30017 represents a population somewhat different from the type by having leaves of the mainstem a bit smaller and more lanceolate. In this population, abundant in individuals, the great majority of the plants had flowers with orange standards, but between 1 and 5% had totally yellow flowers.

Obs. 2. From material of this species (Gregory & al. 9824) collected in Aquidauana, Carranza & Lindquist (1962) described a new fungus, *Thecaphora Frezii* Carr. & Lindq. This basidiomycete attacks the fruits, deforming them by eliminating the isthmus that separates the two articles, thereby giving the affected fruits an appearance similar to those of *Arachis hypogaea* (loc. cit. fig. 1,a). Fortunately, experimental attempts to innoculate the cultivated peanut were not successful.

We dedicate this species to João Geraldo Kuhlmann, who collected the plants in Mato Grosso as a member of the "Comissão Rondon" or "Comissão de Linhas Telegráficas, Estrategicas de Mato-Grosso ao Amazonas."

69. *Arachis hypogaea* L.

Linnaeus, C. Sp. pl. 2: 741. 1753. "Hort. cliff. 353. Hort. ups. 228. Roy. lugdb. 390 ...Habitat in Brasilia, Peru."

Arachidna quadrifolia [Plumier] Trew, Pl. rar., tab. 3, 1764.

Arachidna hypogaea (L.) Moench, Methodus, 122. 1794.

Arachis hypogaea subsp. *oleifera* A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 770, 1933. "(= *A. hypogaea sensu stricto*)."

Maní, Oviedo, 1535. Historia General de las Indias, lib. 7, cap. 5, folio 75. "ysla española."

Lirén ?, Oviedo, 1535. Historia General de las Indias, lib. 7, cap. 12, folio 76. "ysla española y en tierra firme."

Mandibí, Nuñez Cabeza de Vaca, 1555. Naufragios y Comentarios (ed. 1942: 129, 162, 201, 205, 212). Oviedo, 1851. Historia General de las Indias, lib. 23, cap. 12. Paraguay.

La fruta que se cria debaxo de tierra, Monardes, 1565. Historia medicinal de las cosas que se traen de nuestras Indias Occidentales (ed. 1574, 3a. parte: 104). Perú, río Marañón.

Mandues, Schmidel, 1567. Derrotero y viaje a España y las Indias (ed. 1947: 54, 75, 80, 82). Paraguay.

Tlalcacahoatl, Molina, 1571. Vocabulario en lengua castellana y mexicana, 1: 64. Hernández, 1615. Quatro libros de la naturaleza (por Ximenez), ed. 1790, 2: 159, ed. 1946, 3: 159. Sahagun ?, 1831. Historia general de las cosas de la Nueva España (MS, 1575) ed. 1956, 3: 173. México.

Manobi, Lery, 1578. Histoire d'un voyage fait en la terre du Brésil (ed. 1960, 162). Brasil, Bahia de Guanabara.

Truffe de l'Amerique, Dalechamp, 1587. Hist. general. pl. 2: 791, chap. CXXIX. Tomado de Monardes (1565). (Chevalier 1933: 729).

Amendoes, amendois, [Soares de Souza], 1589. Noticia do Brasil. Soares de Souza, 1851. Tratado descritivo do Brasil em 1587 (ed. 1971: 184-185). Brasil, Bahia.

Macara, Alvares de Almada, 1594. Tratado breve dos rios de Guiné (según Ficalho, 1884: 133, Chevalier 1933: 735). Archipielago de Bissagos, Africa.

Nuces quaspian, Clusius, 1601. Rar. pl. hist., lib. IV: 79. Costa de Guinea.

Inchic, Inca Garcilaso de la Vega, 1609. Comentarios Reales (ed. 1943, 2: 179). Perú.

Chocopa, Bertonio, 1612. Vocabulario de la lengua aymara: 306 (reimpr. 1984). Bolivia.

Mandues, carios populi edunt, Bauhin, G. 1623. Pinax, lib. III, sect. I: 90-91.

Manobi, Laet, 1630. Beschrijvinghe van West-Indien 510, first illustration of the fruit (ed. 1633, Novus Orbis seu Descriptionis Indiae Occidentalis, lib. XVIII, cap. XI: 586). (Hammons 1973: 23, fig. 2).

Guerte, Nieremberg, 1635. Historia naturae, maxime peregrinae, lib. XVI, C. 103 (Chevalier 1933: 728).

Arachus [Hypogajos] americanus, underground cicheling of America, indian earthnuts, Parkinson, Jn. 1640. Theatrum botanicum, chap. XI: 1069-1070. "...in most places of America...." Illustrates two open fruits, one of them with two seeds, next to a plant of *Vicia sativa* L. subsp. *amphicarpa* (Dorthes) Ascherson & Graebner (Hammons 1973: 25, fig. 3).

Mandubi, Marcgrave, 1648. Historiae rerum naturalium Brasiliae (ed. 1942: 37, fig.). First illustration of the plant (Hammons 1973: 26, fig. 4). Piso, 1658. De Indiae utriusque re naturali et medica,

256-7, fig. (Hammons 1973: 27, fig. 5).

Fructus peruanus amygdaloides sub terra nascens, Bauhin, J., 1650. Hist. pl. 1(3): 292, cap. 30. Cap. 31, Manobi Lerii.

Cacaguate, Cobo, 1653. Historia del Nuevo Mundo: 359, nombre mexicano.

Pistache, Dutertre, 1654. Histoire générale des isles S. Christophe, de la Guadeloupe, de la Martinique, et autres dans l'Amerique (ed. 1667, Histoire générale des Antilles 2: 121).

Aracus [Hypogajos] Americanus, Ray, 1686. Hist. pl. 1: 919.

Arachidna Indiae utriunque tetraphylla, Hermann, 1689. Paradisi batavi prodromus, 314. Sloane, 1696. Cat. pl. Jamaica, 72.

Senna tetraphylla s. Absi congener hirsuta Maderaspatensis flore flavo siliquis punctatis scabris, foliculos sub terram condens, Plukenet, 1691. Phytographia, tab. LX, fig. 2. Plukenet, 1696. Almagestum, 341-2. Madras (India) (BM!).

Pindals, Sloane, 1696. Cat. pl. Jamaica, 72.

Arachidna quadrifolia, villosa, flore luteo, Plumier, 1703. Nova pl. amer. 49, fig. 37.

Lupinus quadrifolius exoticus, Barrelier, 1714. Plantae per Galiam, Hispaniam et Italiam observatae, tab. 1215.

Arachidnoides americana, Nisolle, 1723. Mém. Acad. Sci. (Paris): 387-392, fig.

Arachis, Linnaeus, 1735. Syst. nat., Diadephia Decandria, nomen. Linnaeus, 1737. Gen. pl. ed. 1, 592. Linnaeus, 1737. Hort. Cliff. 353-4, Brasilia & Perú (BM!). Linnaeus, 1748. Hort. upsal. 1: 228-9.

Chamaebalanus japonica, Rumphius, 1747. Herb. amboin. 5: 426, tab. 156.

Earth or Groundnut, Miller, 1754. Gard. Dict. abr. ed. 4, 116. Africa.

Cacahuete, Terreros, 1765-83. Diccionario Castellano.

Pea-nut, Gray, Asa. 1856. The flowers of the peanut (*Arachis hypogaea* L). Amer. Jour. Sci. and Arts, 2nd Ser. 22: 435-436.

Lectotype: In the Linnean herbaria, *Arachis hypogaea* is represented by three specimens, very similar to one another. The one at the Linnean Society (LINN, 901-1) only has the annotation "HU" (Hortus Upsaliensis) and could have been incorporated after 1753 because it lacks the no. "1" indicating its position in the text of *Species Plantarum* (1753). The specimen of the Linnean Herbarium of Stockholm (S, 307-19) and that of the Clifford Herbarium (BM) are two syntypes to take into account for typification.

The specimen LINN, 909-1, "HU," that Krapovicka's and Rigoni (1960: 214) considered as the type and Verdcourt (1971: 442) as a syntype, should not be discarded because in *Hortus Upsaliensis* (1748) it is an element that appears in the protologue of *Species Plantarum*.

Nevertheless, it would be safer to choose the specimen from the Clifford Herbarium (BM) as the lectotype, being the one that offers a greater degree of certainty in terms of its authenticity and for being linked to the original idea that Linnaeus had regarding this species, given that *Hortus Cliffortianus* (1738) is the oldest reference by Linnaeus that appears in the protologue.

The Clifford Herbarium specimen and that of the Linnean Society are very similar and are both prepared in the same manner, with all the leaves well extended. They are lateral branches, distichal, with very similar, glabrous leaves. In the first of these specimens (BM), the type of ramification cannot be seen; but in the second (LINN), two nodes with inflorescences are followed by two nodes with short vegetative branches and two nodes with inflorescences. The specimen S, 307-19 has leaves with the leaflets folded and an alternating ramification pattern can be seen: two inflorescences, one vegetative branch, two inflorescences and an apical vegetative branch. In his *Species Plantarum*, Linnaeus does not mention the number of seeds, but he does in his *Genera Plantarum*, ed. V (1754: 329) where he says that *Arachis* has fruits with two seeds. All of these characteristics correspond to the Virginia-type peanut, commonly cultivated in the eastern United States.

First reports of the peanut: The first published mention of the peanut that we know of is owed to Gonzalo Hernández de Oviedo y Valdés (1478-1557), in his "Historia General y Natural de las Indias, Islas y Tierra Firme del Mar Océano," that appeared for the first time in Seville in 1535. This chronicler arrived in the Americas for the first time in 1514 and resided

in those lands until his death, except for a few trips that he made to Spain. His account is the principal result of the experiences he acquired during his travels and work in Tierra Firme (northern Colombia and Venezuela), Panama, Nicaragua and the Antilles.

In "La Historia General de las Indias," which is the title that appears on the first page of the *princeps* edition, Oviedo expressly mentions the peanut in Book 7 "De la agricultura," Chapter V (fol. LXXV), and writes:

"Of the *maní* [peanut] which is another fruit and ordinary sustenance that the Indians have on this island of Hispaniola. One fruit that the Indians have on this island of Hispaniola is called *maní*, which they plant and harvest and is a very ordinary plant for them in their gardens, and is sized like pinenuts with shells, and they hold them to be healthful, but the Christians take little comfort in them, being eaten mostly by lowly men and boys and slaves and by people who do not pardon their taste for anything. It is of mediocre flavor and of little substance, but is very common with the Indians, and is found in great quantities on this island and others."

Except for the name and the fact that the *maní* is "sized like pinenuts with shells," it is difficult for us to recognize this plant as the peanut given that Oviedo adds that "it is of mediocre flavor and of little substance."

On the other hand, it is quite likely that when discussing *lirenes*, Oviedo provides a good description of *Arachis hypogaea*. In the same Book 7, Chapter XII (folio LXXVI), it reads:

"Of the plant and fruit called *Lirenes*. *Lirenes* is a fruit that is borne on a plant that the Indians cultivate and even today the Christians on this island grow them in their fields and gardens and inherited lands. This is an herb that extends itself and lays its branches on the ground and they sow it from the plant itself as I have been told is done with the *ajes* or *batatas* and under the ground they bear their fruit which is white and of the size of thick dates and some larger and smaller also of white color, and each fruit of these is attached or tied by a thin stem with which it is connected to the branch. The Indians cook these and these days the markets abound with them and they take them to sell cooked, and with their coverings removed they are very white inside and of good flavor. I have not seen in Spain nor anywhere a fruit or flavor that compares with these *lirenes*. But nevertheless, this fruit is of good flavor and there is plenty of it on this island of Hispaniola and on the mainland and in many parts of these Indies."

Oviedo says the same in the second edition (Oviedo 1547). In the edition of José Amador de los Ríos (Oviedo 1851, 1: 279-280) he contextually repeats this description of *lirenes*, with the additional statements that "that vein that attaches the *liren* is no thicker than a common needle" and "and removing that little skin covering, which is thinner and softer than the skin of a walnut, and inside remains the white *liren* and it is of good flavor."

Evidently, when Oviedo speaks of *lirenes*, he is describing the plant of *Arachis hypogaea*. By virtue of his details that the branches extend themselves like those of the *ajes* (*Dioscorea trifida* L.f.) and *batatas* (*Ipomoea batatas* (L.) Lam.), from which are suspended the fruits that are produced underground, there remains almost no doubt regarding this supposition, given the unique fruiting characteristics of *Arachis hypogaea*. Moreover, by this description we are able to recognize a runner-type peanut.

It is currently accepted that *leren* or *lairen* is a name applied to *Calathea allouia* (Aubl.) Lindl. (*Marantaceae*), an erect monocot with edible starchy tubers (León 1987: 106).

Bartolomé de Las Casas (1474-1566), a contemporary of Oviedo, mentions *maní* (Las Casas 1909: 29), whose fruit compares with that of broad beans, field peas and chickpeas and the seeds with shelled hazelnuts. In this work of Las Casas, which went unpublished until 1909, *maní* can be recognized as *Arachis hypogaea* and it was in this form that its name was disseminated throughout Spanish America, replacing many local vernacular names.

The first illustration of the fruit was published by Laet (1630) and reproduced by Hammons (1973: 23, fig. 2). It depicts a "Virginia" type peanut, that we can identify as *Arachis hypogaea* L. var. *hypogaea*, for which Laet does not indicate the place of origin

of the illustrated material.

Hammons (1973: 22, fig. 1) reproduces a figure from Clusius (1605) as a possible first illustration of the seeds of *Arachis hypogaea*, but this interpretation, which Sloane (1696: 72) indicated as doubtful, is not precise since the marked veins and the pronounced thread more closely resemble allspice (*Myristica fragrans* Houtt.).

The first illustration of the peanut plant was published by Marcgrave (1648, 1: 37), reproduced by Hammons (1973: 26, fig. 4). Both the description as well as the illustration permit the identification of the "mandubí" of Marcgrave as the peanut called "crema" in Bolivia and "guaycurú" or "guanaco" in Paraguay and in NE Argentina, and whose cultivation we know from Bolivia, northeastern Argentina, Paraguay and Brazil. This "mundubí" of Marcgrave, therefore, would belong to the var. *hypogaea*.

Origin of the cultivated peanut: *Arachis hypogaea* has 2n=40 chromosomes (Kawakami 1930 and Husted 1931) and its polyploid condition was established by Husted (1936) in a classic work on the morphology of its chromosomes.

Numerous attempts at interspecific hybridization were made to establish the relationships between *A. hypogaea* and the wild species of the genus *Arachis*. The first such cross was made by Gregory (1946, fig. 29) using the cv. 'N.C. Bunch' x *Arachis glabrata*, "polyploid," obtaining only undeveloped seeds. Later, the cross of *A. hypogaea* with *A. Archeri* was attempted (Smith 1956 and Johansen & Smith 1956, sub *A. Diogoi*) in which, although fertilization had begun, there were failures in the embryo's formation.

The first hybrid (Krapovickas & Rigoni 1949, 1951) was achieved by crossing *A. hypogaea* var. *fastigiata* (2n=40) with *A. correntina* (2n=20), obtaining a sterile F_1 with 30 chromosomes and irregular meiosis. Later, these authors attempted to cross *A. hypogaea* with the diploids *A. duranensis* (sub *A. pusilla*), *A. villosa*, *A. villosulicarpa* and the tetraploid *A. glabrata* var. *Hagenbeckii*, obtaining a satisfactory result only with *A. villosa* which produced a sterile hybrid (Krapovickas & Rigoni 1957: 438).

Then, Krapovickas & Rigoni (1954, 1957) successfully crossed *A. hypogaea* with the new species *A. monticola* (2n=40), obtaining fertile offspring and demonstrating *A. monticola* to be the wild species most closely related to the cultivated peanut.

Thereafter, numerous crosses were made involving more species, all from the section *Arachis* (Gregory, M.P. & W.C. Gregory 1979, Smartt 1990).

It is possible that *A. monticola* is a wild ancestor of *A. hypogaea*, but the alternative possibility that it is a derivative or feral form of the cultivated peanut should not be discarded. A mechanism of reversion to the wild condition is outlined by Krapovickas & al. (1974), when describing *A. Xbatizogaea* Krapov. & Av. Fernández, as the result of the recuperation of fertility in a sterile interspecific hybrid, with the participation of *A. Batizocoi* and *A. hypogaea*.

Arachis hypogaea is an amphidiploid whose ancestors have still not been conclusively determined. Various species have been proposed as possible ancestors of the cultivated peanut. Gregory & Gregory (1976, 1979) expressed the possible participation of species belonging only to the section *Arachis*, proposing *A. Cardenasii* and *A. Batizocoi* as the probable diploid progenitors of the cultivated peanut (Smartt & al. 1978). *Arachis duranensis* and *A. ipaënsis* have even better possibilities (Fernández & Krapovickas 1994), but the participation of more than two species should not be discarded, taking into account the differences between the two subspecies of *A. hypogaea*.

The range of the diploid species involved in the origin of the cultivated peanut is restricted to NW Argentina and SE Bolivia.

The characters of these wild species that we can find in *A. hypogaea* are: runner habit, small fruits with marked constriction and evident but subdued reticulation, with two seeds, and these demonstrating dormancy. This suite of characters, which we can consider primitive, is found only in the subsp. *hypogaea* (Simpson & al. 1986).

In South America, the subsp. *hypogaea* has its most important center of variation in Bolivia

and it is in SE Bolivia, on the first foothills of the Andes, in the departments of Tarija and Chuquisaca, where we collected samples of cultivated peanut with the greatest amount of those characters that we consider primitive. In this area are found only the annual diploid species *A. duranensis*, *A. ipaënsis* and *A. Batizocoi*. On the other hand, *A. Cardenasii*, also a diploid, is a perennial and lives further to the east, in the Chiquitana hills. The other species involved, *A. monticola*, is an annual, tetraploid, and occurs in a very small area between 10 and 20 km NW of the city of Jujuy, where peanut is not presently cultivated, although there are historic and archeological evidences of its pre-Columbian existence (Salas 1945).

A notable difference between subsp. *hypogaea* and subsp. *fastigiata* is the color of the leaves, dark green in the former and light green in the latter. It is a very constant character, except for a few accessions of subsp. *hypogaea* from south-central Peru. Another difference between the subspecies is the presence of flowers on the mainstem in subsp. *fastigiata* and their absence in subsp. *hypogaea*, also being a very constant character, but which does not apply to the "Cruceño" peanut which pertains, evidently, to subsp. *fastigiata* and is grown in NE Bolivia from Santa Cruz northward.

The facts suggest that subsp. *hypogaea* had its origin in SE Bolivia and that subsp. *fastigiata* had differentiated itself further to the north, possibly in Peru, where it shows its greatest variability with the presence of the vars. *fastigiata*, *peruviana* and *aequatoriana*, without discarding the possible participation of some other wild species. The antiquity of peanut cultivation in the Andean region is manifested in the diverse ways it is used. In Bolivia it is a common element of the daily diet, being boiled in soups, chopped, mixed in cornbreads or cakes (Rusby 1901) and used to produce a fermented beverage, "chicha de maní" (Weddell 1853).

Key for distinguishing the taxa of *A. hypogaea*

A. Mainstem without flowers and n+1 branches which alternate regularly: two vegetative and two reproductive (alternate branching).

69a. subsp. *hypogaea*

B. Leaflets with underside glabrous or with a few hairs on the midvein.

1. var. *hypogaea*

B'. Leaflets with hairs 1-2 mm long on the underside, dispersed across entire surface.

2. var. *hirsuta*

A'. Mainstem with flowers and lateral branches on which the reproductive and vegetative branches present themselves in no specific order (sequential branching).

69b. subsp. *fastigiata*

C. Fruits with more than two seeds. Extended fruiting.

D. Leaflets with the underside glabrous or with hairs only on the midvein.

E. Fruits with subtle or slightly marked reticulation, without pronounced longitudinal ribs. Reproductive branches usually short and slender.

1. var. *fastigiata*

E'. Fruits always with sharply marked reticulation and with outstanding longitudinal ribs. Reproductive branches long, 5-10 cm, robust, both on the mainstem and on the lateral branches.

2. var. *peruviana*

D'. Leaflets with hairs on the underside 1-2 mm long, dispersed across entire surface. Reproductive branches long, primarily on the lateral branches. Mainstem commonly with inflorescences or short reproductive branches.

3. var. *aequatoriana*

C'. Fruits usually with two seeds. Fructification clustered around the base of the plant. Frequently with compound spikes.

4. var. *vulgaris*

69a(1). *A. hypogaea* subsp. *hypogaea* var. *hypogaea*

A. africana Lour., Fl. Cochinch. 2: 430. 1790. *"Habitat in variis locis Africae orientalis," non Arachis africana* Burm. F. 1768 = *Voandzeia subterranean* (L.) Thouars. According to Loureiro's description, it is a runner-type peanut, with glabrous leaflets and 2-3-seeded fruits.

A. hypogaea var. *glabra* DC. Prodr. 2: 474. 1825. *A. africana* Lour. is mentioned as a synonym.

A. hypogaea var. *aegyptiaca* Hassk., Retzia 1: 190. 1855. *"In horto bogoriensi coluntur specima ex Aegypto introducta."* A prostrate form that Hasskarl supposes to be perennial, with fruits 1-2 (rarely 3) -seeded.

A. hypogaea var. *indica* Kurtz, Verh. Bot. Vereins Prov. Bradenburg: 45. 1875. Latin name for the "Arachide de l'Inde" that Cordemoy (1886: 249) describes as prostrate.

A. guaraniana Bertoni, Catálogo espec. o var. plant. cult. Estac. Agron. Pto. Bertoni: 6. 1912. The description is very brief, and may refer to the "guaycurú" peanut according to the specimen "Puerto Bertoni, Alto Paraná, leg. T. Rojas 8157, junio 1938" (SI).

A. hypogaea subsp. *procumbens* Waldron, Contr. Bot. Lab. Morris Arbor. Univ. Pennsylvania 4(2): 312. 1919. Includes the cultivars "North Carolina," "Virginia Runner," "Virginia Bunch" and "Jumbo."

A. hypogaea var. *africana* Girola, Cult. Maní Argentina, 17. 1922. Based on *A. africana* Lour. (illegitimate name). *Non* Kurtz.

A. nambyquarae Hoehne, Com. lin. telegr., Bot. Annexo 5, 12: 21, táb. 190. 1922. "N° 2052, Kuhlmann, Pimenta Bueno, Rondonia, Matto Grosso, em Abril de 1919 (Cultivada de sementes trazidas desta localidade, onde a planta é cultivada pelos indios Nambyquaras, na maloca do cacique Abaitora)" (R!).

A. hypogaea subsp. *africana* Bois, 1927. Plantes aliment. 1: 96. 1927. Based on *A. africana* Lour., illegitimate name.

A. hypogaea subsp. *africana* var. *communis* A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9(91): 193. 1929. Lectotype: "arachide du Cayor" (subvar. *pallida*). Adam, L'Arachide, 32, fig. 13. 1908. Bouffil, Biologie de l'arachide, 54, fig. 7, I. 1947.

A. hypogaea subsp. *africana* var. *robustior* A. Chev., l.c., 193. 1929. "Dotiga (bambara de Ségou), Lotiga ou Loséno (bambara de Haute-Guinée)." Adam, L'Arachide, 34. 1908.

A. hypogaea subsp. *africana* var. *microcarpa* A. Chev., l.c., 193. 1929. Type: "Fila tiga ou Dion gouassi du Soudan." Adam, L'Arachide, 35. 1908.

A. hypogaea subsp. *asiatica* var. *macrocarpa* A. Chev., l.c., 194. 1929. "Tigakoumba, Sokoba, Sokoba tiga, Tiga ba (en bambara), Sama tiga (Arachide de l'Elephant), Faréba (en Kassonké). Les fruits et les grains par leur taille rappellent la var. *robustior*, mais la plante est dressée." In 1933, Chevalier includes the North American "Virginia Bunch" and "Virginia Runner" peanuts in this variety. Adam, L'Arachide, 33-34, fig. 18. 1908.

A. rasteiro A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9: 487. 1929. Chevalier creates a Latin name for the plant whose fruits he describes and illustrates in the same volume [9(91): 196-197, pl. 5, no.1 and pl. 6, no. 3]. Native to Santa Catharina, Brazil, its fruits have 3 and up to 4 seeds with a bi-colored seed coat, and it is similar to the "Nambyquarae" peanut but with somewhat smaller fruits: 4-5.5 cm long and 15-18 mm in diameter.

A. hypogaea subsp. *rasteiro* (A. Chev.) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 772. 1933. Based on *A. rasteiro* A. Chev.

A. hypogaea subsp. *nambyquarae* (Hoehne) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 13(146-147): 77. 1933. Based on *A. nambyquarae* Hoehne.

A. hypogaea var. *nambyquarae* (Hoehne) Burkart, Darwiniana 3(2): 281. 1939.

A. hypogaea forma *macrocarpa* (A. Chev.) Hoehne, Flora Brasílica 25(2)122: 18. 1940.

A. hypogaea forma *microcarpa* (A. Chev.) Hoehne, l.c., 19. 1940.

A. hypogaea forma *typica* Hoehne, l.c.: 18. 1940.

A. glabrata Benth. subsp. *rasteiro* (A. Chev.) A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 28: 515. 1948.

A. hypogaea forma *communis* (A. Chev.) F.J. Herm., Synop. *Arachis*, 14. 1954.

A. hypogaea forma *nambyquarae* (Hoehne) F.J. Herm., l.c. 14. 1954

Herbaceous annual, usually late-fruiting. Mainstem erect, without inflorescences. Lateral branches usually procumbent, sometimes decumbent. On the basal lateral branches (n+1), two vegetative branches alternate regularly with two reproductive branches. Medium-sized leaves; leaflets glabrous on both sides, or with some hairs on the underside midvein. Reproductive spikes simple, short, rarely up to 5 cm long. Fruits typically with 2 (3) seeds and in some Bolivian landraces up to 4 seeds; pericarp moderately reticulate.

69a(2). *A. hypogaea* subsp. *hypogaea* var. *hirsuta* Köhler

Köhler, Med.- Pfl. 3, 42. 1898. Based on *A. asiatica* Lour. (the illustration does not correspond to Loureiro's entity).

A. asiatica Lour., Fl. cochinch. 2: 430. 1790. "*Habitat culta abundantissime in Cochinchina, & in China.*" (BM!). Details of the description such as "*caulis ... pilosissimus, suberectus, ramis diffusis procumbentibus ... foliolis pilosis ... folliculus 3-4-spermus*" permit the identification of this taxon.

A. procumbens Berneaud, in Guerin, Dict. Hist. Nat. 1: 248. 1834.

A. hypogaea L. var. *asiatica* (Lour.) Girola, Cult. Maní Argent. 17. 1922.

A. hypogaea L. subsp. *asiatica* (Lour.) Bois, Plantes aliment. 1: 96. 1927. Based on *A. asiatica* Lour.

Herbaceous annual, very late-fruiting, much-branched and of great size. Mainstem is erect to prostrate, up to 1 m long, sinuous, without inflorescences. Branches are extended, sinuous, from procumbent to decumbent. On the principal lateral branches (n+1), two vegetative branches alternate regularly with two reproductive branches. Leaves medium-sized; leaflets with the upper surface glabrous and with hairs 1-2 mm long spaced across the underside. Reproductive spikes simple, 1-2 cm long. Fruits with up to three, rarely four seeds; pericarp strongly reticulate, with uniform reticulation.

Geographic distribution. This peanut is frequently encountered in the archaeological deposits from the coast of Peru. In modern times it is still cultivated in the Americas, on the coast of Peru and in central Mexico, as well as in the basins of the Pacific and Indian Oceans. This is the peanut that Plukenet (1691) indicated as coming from Madras, in southeastern India, and that Rumphius (1747) called *Chamaebalanus japonicus*. It is known from the Philippines (Blanco 1878, 2: 362), Java (Dubard 1906, fig. 2), China (Dubard 1906, fig. 3; Skvortzow 1920: 144), Madagascar (Dubard 1906, figs. 4 & 5), and from the burials of Ancón, in Peru (Dubard 1906, fig. 1).

69b. *A. hypogaea* subsp. *fastigiata* Waldron

Waldron, Contr. Bot. Lab. Morris Arbor. Univ. Pennsylvania 4: 312. 1919. Lectotype: cvar. 'Valencia' (Krapovickas & Rigoni 1960: 225).

A. hypogaea var. *africana* Kurtz, Verh. Bot. Vereins Prov. Brandenburg 17: 45. 1875. Latin name for the "Arachide d'Afrique" of Cordemoy (1866: 249).

A. hypogaea var. *asiatica* (Lour.) Girola forma *rosada* Girola, Cult. Maní Argent., 17. 1921.

69b(1). *A. hypogaea* subsp. *fastigiata* var. *fastigiata*

A. hypogaea var. *asiatica* (Lour.) Girola forma *oscura* Girola, Cult. Maní Argent. 17, photo. 23. 1921. Erect plant with 3-4-seeded fruits.

A. hypogaea var. *communis* A. Chev. subvar. *violacea* Burkart, Darwiniana 3(2): 279. 1939. "Maní negro de Corrientes y Misio-

nes," que "tiene generalmente 2-4 semillas por vaina."

Herbaceous annual, early-fruiting. Mainstem usually little-branched and with some inflorescences. Lateral branches decumbent to semi-erect, with irregular distribution of vegetative and reproductive branches (sequential branching). Leaves medium to large, leaflets with both surfaces glabrous, but may present some hairs on the underside midvein. Short, axillary inflorescences. Fruits usually with up to four seeds; pericarp moderately reticulate.

Geographic distribution. This peanut has its most important center of variation in Paraguay and is the most widespread variety in all of South America. Its diffusion outside South America must be relatively recent. It only begins to appear in the literature at the end of the 19th century. The erect habit and fruits with four or more seeds permit its identification. Handy (1896: 7) mentions the "Georgia red nut" and the "Tennessee" as being erect, with 3-4 seeds, and indicates that there is a peanut grown in Costa Rica with 4 to 5 seeds. It is illustrated by Dubard (1906, fig. 6). Beattie (1909: 28, fig. 16, D) illustrates the fruit of "Tennessee Red," with 4 seeds, with an undulating dorsal surface, with a beak and reticulate pericarp. The name "Valencia" appears for the first time in 1911, when Beattie mentions it as a new introduction from Spain, similar to, but better than, "Tennessee Red."

69b(2). *A. hypogaea* subsp. *fastigiata* var. *peruviana* Krapov. & W.C. Gregory *nov. var.*

Rami erecti aut decumbentes ramificatione sequentiali. Folia subtus glabra, margine nervoque medio tantum pilos plus minusve longos gerentia. Fructus 3-4-seminatus. Pericarpium perspicue reticulatum nervis longitudinalibus valde prominentibus.

Holotype: ARGENTINA. Córdoba. Manfredi, Estación Experimental Agropecuaria, INTA, crop 86/87: 2752, "Tingo María," granos veteados, 23-III-1987, leg. Krapovickas, Vanni & Williams 41725 (CTES). Isotypes: BAB, CEN, LIL, LPB, MO, NY, SI, SP, US. Place of origin: Peru, Estación Experimental Agropecuaria "La Molina," collection L.D. Tripp (USDA PI 393531).

Herbaceous annual. Mainstem with vegetative branches toward the base and reproductive branches toward the apex. Lateral branches decumbent, with very few or without vegetative branches. Reproductive branches 5-10 cm long, thick, multiflowered, sometimes with leaves toward the apex, abundant on the mainstem as well as on the lateral branches. Leaves large, somewhat thick. Leaflets glabrous on both sides, with hairs only on the margin and on the underside midvein. Fruit usually with three seeds, in some landraces up to four seeds; pericarp strongly reticulate and with outstanding longitudinal ribs.

Geographic distribution. The variety *peruviana* is grown in almost all of Peru, especially in the basin of the Marañón River, and it is common in Ecuador. Its southern limit is found in northern Bolivia, where a few samples were discovered in Rurrenabaque on the Beni River and in the department of Pando. A few samples were also obtained in Acre state in Brazil.

Obs. 1. It is possible that it is "the fruit that is grown underground" of Monardes (1565), that is "all twisted, with a very fine figure ... it grows underground, on the shores of the Marañón River."

Obs. 2. In the var. *peruviana* there are numerous landraces that vary according to the shape of the fruit and the color of the seed. The most frequent colors are black or violet, and cream, but there are also variegated or streaked seeds, as in the case of "Tingo María," that are exclusive to var. *peruviana*.

69b(3). *A. hypogaea* subsp. *fastigiata* var. *aequatoriana* Krapov. & W.C. Gregory *nov. var.*

Rami erecti aut decumbentes ramificatione sequentiali. Folia subtus pilis ca. 2 mm longis vestita. Fructus 3-4-seminatus. Pericarpium

perspicue reticulatum nervis longitudinalibus valde prominentibus.

Holotype: ARGENTINA. Córdoba. Manfredi, Estación Experimental Agropecuaria, INTA, cult. 77/78: 1403, "Zaruma," 22-III-1978, leg. Krapovickas 33756 (CTES). Isotypes: BAB, CEN, LIL, LPB, MO, NY, SI, SP, US. Place of origin: Ecuador, El Oro, Zaruma, leg. Polobio A. Romero, 1948.

Herbaceous annual. Mainstem erect, more or less branched, with reproductive branches usually short, less than 5 cm long. Lateral branches decumbent, with reproductive branches up to 20 cm long. Large leaves. Leaflets with upper surface glabrous and underside with hairs 1-2 mm long dispersed across entire surface. Fruit 3-4-seeded; pericarp very reticulate, with outstanding longitudinal ribs.

Geographic distribution. This variety is almost exclusively from Ecuador where it is cultivated primarily in the provinces of El Oro and Loja. It is cultivated sporadically in northern Peru.

Obs. Two landraces are known in the var. *aequatoriana*: "Zaruma" with fruits some 4 cm long, and "Huasquillo" with fruits frequently 7 cm long and thinner. The seed color is commonly violet, but may be cream or more rarely red.

69b(4). *A. hypogaea* subsp. *fastigiata* var. *vulgaris* C. Harz

Harz, Landw. Samenk., 642. 1885. Latin name for the var. "comune" of Blanco (1850: 525, figs. 1, 2 & 3).

Arachidna quadrifolia Trew, Pl. rar., tab. 3. 1763.

Glycine subterranea auct. non L., Gilii e Xuarez, Observazioni fitologiche. 30-31, tab. 4. 1789.

Arachis americana Tenore, Atti Real Ist. Incoragg. Sci. Nat. Napoli 1: 48-50. 1811.

A. hypogaea var. *reticulata* Harz, Landw. Samenk. 642. 1885. Latin name for the var. "Rochet" of Blanco (1850: 525, figs. 6, 7, 8, 9 & 10).

A. hypogaea subsp. *asiatica* var. *erecta* A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9(91): 194. 1929. Lectotype: "Guerté volute (de Gandiole au Sénégal)." Adam, L'Arachide, 32, fig. 16. 1908.

Herbaceous annual. Mainstem erect, highly branched, with some inflorescences. Lateral branches decumbent to erect, with short inflorescences, 1-2 cm long, simple or compound, grouped around the basal nodes. Medium-sized leaves. Leaflets with both surfaces glabrous, with long hairs on the margin and also a few hairs on the underside midvein. Fructification clustered around the base of the plant. Fruits small, usually two-seeded; pericarp moderately reticulate.

Geographic distribution. The variety *vulgaris*, which comprises the "Spanish" peanuts, is grown in South America in Uruguay, in Argentina (Santa Fe, Entre Ríos and Corrientes), in southern Brazil and, to some extent, in Paraguay. The color of the seed is commonly cream, such as in the typical "Spanish" peanuts, but can be black and very rarely red. The peanut with cream-colored seeds passed to southern Europe at the end of the 18th Century (Gilii e Xuarez 1789, Tabares de Ulloa 1799). According to McClenny (1935: 9), "Spanish" peanuts were introduced to Virginia, USA, in 1871 from Malaga, Spain.

Taxa of dubious position

Arachis guaranitica Bertoni, Anales Ci. Parag. ser. 2(5): 331. 1919, *nomen nudum non* Chodat & Hassler 1904.

Arachis hypogaea subsp. *africana* var. *stenocarpa* A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 9(91): 193. 1929. "Nzayan, Tigadian (bambara, ...). Maka diangon (Kassanké)." A runner peanut with 3-4-seeded fruits that Chevalier identifies with the "Peruviano" type of Dubard and includes the "Tennesee Red" that, for its growth habit, would be a transition to the subsp. *asiatica*.

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Numerical List of the Taxa

1 - *A. guaranitica*
2 - *A. tuberosa*
3 - *A. Martii*
4 - *A. brevipetiolata*
5 - *A. Oteroi*
6 - *A. Hatschbachii*
7 - *A. cryptopotamica*
8 - *A. major*
9 - *A. Benthamii*
10 - *A. douradiana*
11 - *A. gracilis*
12 - *A. Hermannii*
13 - *A. Archeri*
14 - *A. stenophylla*
15a - *A. paraguariensis* ssp. *paraguariensis*
15b - *A. paraguariensis* ssp. *capibarensis*
16 - *A. setinervosa*
17 - *A. Macedoi*
18 - *A. marginata*
19 - *A. prostrata*
20 - *A. lutescens*
21 - *A. retusa*
22 - *A. Burchellii*
23 - *A. Pietrarellii*
24 - *A. villosulicarpa*
25 - *A. triseminata*
26 - *A. Giacomettii*
27 - *A. sylvestris*
28 - *A. pusilla*
29 - *A. Dardani*
30 - *A. repens*
31 - *A. Pintoi*
32 - *A. lignosa*
33 - *A. Kretschmeri*
34 - *A. Rigonii*
35 - *A. chiquitana*
36 - *A. matiensis*
37 - *A. appressipila*
38 - *A. Vallsii*
39 - *A. subcoriacea*
40 - *A. Burkartii*
41 - *A. pseudovillosa*
42a - *A. glabrata* var. *glabrata*
42b - *A. glabrata* var. *Hagenbeckii*
43 - *A. glandulifera*
44 - *A. cruziana*
45 - *A. monticola*
46 - *A. magna*
47 - *A. ipaënsis*
48 - *A. valida*
49 - *A. Williamsii*
50 - *A. Batizocoi*
51 - *A. duranensis*
52 - *A. Hoehnei*
53 - *A. stenosperma*
54 - *A. praecox*
55 - *A. palustris*
56 - *A. benensis*
57 - *A. trinitensis*
58 - *A. decora*
59 - *A. Herzogii*
60 - *A. microsperma*
61 - *A. villosa*
62 - *A. helodes*
63 - *A. correntina*
64 - *A. Simpsonii*
65 - *A. Cardenasii*
66 - *A. Kempff-Mercadoi*
67 - *A. Diogoi*
68 - *A. Kuhlmannii*
69 - *A. hypogaea*
69a - *A. hypogaea* ssp. *hypogaea*
69a1 - *A. hypogaea* ssp. *hypogaea* var. *hypogaea*
69a2 - *A. hypogaea* ssp. *hypogaea* var. *hirsuta*
69b - *A. hypogaea* ssp. *fastigiata*
69b1 - *A. hypogaea* ssp. *fastigiata* var. *fastigiata*
69b2 - *A. hypogaea* ssp. *fastigiata* var. *peruviana*
69b3 - *A. hypogaea* ssp. *fastigiata* var. *aequatoriana*
69b4 - *A. hypogaea* ssp. *fastigiata* var. *vulgaris*

List of Collectors[9]

Addor, A. s/n (20).

Adolfo M. 443 (66).

Aguilar, V. 106 (63).

Ahumada, O., L. Ferraro, C. Chiffa & S.G. Tressens 118 (63).

Ahumada, O. 2502 (40).

Ahumada, O. & A. Schinini 3879 (40).

Ahumada, O. 6236 (45).

Allem, A.C. 120 (68), 644 (37), 646 (37), 661 (67), 685 (15a), 699 (8), 718 (7), 720 (42a), 721 (42a), 731 (20), 732 (62), 734 (62), 744 (68), 750 (39), 760 (37), 761 (37).

Allem, A.C. & J.G.A. Vieira 1318 (33), 1452 (37), 1455 (37), 1663 (68).

Allem, A.C., J.F.M. Valls, J.G.A. Vieira & J.A. Comastri 2147 (33), 2269 (68).

Allem, A.C., J.G.A. Vieira & W.L. Werneck 2796 (53), 2824 (19).

Allem, A.C., G.L. Webster & W.L. Werneck 3070 (19).

Allem, A.C. 3485 (58).

Allemão, Freire s/n (27).

Allemão, F. Freire & M. D. Cysneros 364 (27).

Anderson, W.R. & al. 6847 (19).

Anderson, W.R. 7021 (22), 11247 (42a), 11298 (9), 11338 (39), 11339 (20), 11352 (20).

Anderson, W.R., M. Stieber & J.H. Kirkbride 37175 (31).

Andrade Lima, D. de 3018 (20), 64-4200 (25), 65-4317a (25), 67-5006 (29), 68-5328 (22), 68-5329 (27).

Anzótegui, L.M. 1210 (63).

Aranda, D. 69 (42a).

Arbo, M.M. 21 (42a), 449 (63).

Arbo, M.M. & A. Schinini 548 (63).

Arbo, M.M., A. Schinini, O. de Coll & R.O. Vanni 839 (63), 1029 (42a), 1057 (42a).

Arbo, M.M. 1088 (63).

Arbo, M.M., S.G. Tressens, A. Schinini & M.S. Ferrucci 1762 (15a), 1764 (42a), 1796 (42a), 1871 (42a), 1875 (42a).

Arbo, M.M. & A. Schinini 2449 (40).

Arbo, M.M., A. Schinini & I. Basualdo 2878 (42a).

Arbo, M.M., R. Monteiro, A. Schinini & A. Furlan 3485 (19), 3515 (19), 3537 (19), 3555 (19), 3556 (17), 3665 (19), 3669 (19).

Archer, W.A. & A. Gehrt 0017 (42a), 0098 (42a), 0137 (42a), 0138 (13), 0151 (5), 3967 (13), 3968 (13), 3982 (9) **[IAC V. 83]**, SP 35771 (42a), SP 36469 (42a), SP 36470 (5), SP 36473 (5).

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[9]This list includes all of the specimens studied. In the descriptions of species for which there is an abundance of specimens, "selected materials" were chosen, taking care not to omit the collecting localities. Numbers appearing in brackets and in bold indicate the parent numbers used by M.P. Gregory & W.C. Gregory (1979). Numbers preceeded by **V** or **IAC** correspond to the Instituto Agronómico de Campinas.

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Valls, J.F.M., C.E. Simpson & W.L. Werneck 6671 (30), 6673 (30), 6674 (30), 6676 (27), 6709 (27), 6727 (31), 6728 (31), 6740 (31), 6741 (31), 6744 (27), 6759 (18), 6767 (27), 6772 (25), 6773 (27), 6781 (27), 6784 (31), 6785 (27), 6788 (19).

Valls, J.F.M., C.E. Simpson, W.L. Werneck & J.M. Santos 6791 (31), 6792 (31).

Valls, J.F.M. & J.O.N. Gonçalves 6898 (40).

Valls, J.F.M., A. Krapovickas, R.F.A. Veiga & G.P. Silva 7002 (27), 7004 (19), 7037 (27), 7039 (29), 7055 (29), 7058 (19), 7060 (27), 7062 (29), 7063 (29), 7065 (27), 7068 (19), 7071 (27), 7076 (27), 7079 (27), 7081 (27), 7086 (29), 7105 (27), 7123 (27), 7126 (27), 7130 (27), 7144 (27), 7156 (27), 7165 (27), 7166 (29), 7172 (27), 7176 (27), 7180 (27), 7191 (27), 7194 (27), 7197 (29), 7215 (29), 7232 (25), 7243 (25), 7246 (25), 7287 (27), 7289 (27), 7292 (25), 7294 (27).

Valls, J.F.M., J.P. Moss & G.P. Silva 7300 (42a), 7302 (42a), 7305 (42a).

Valls, J.F.M., J.P. Moss, M.A.N. Gerin & G.P. Silva 7317 (40), 7320 (40), 7330 (40), 7332 (30), 7333 (40), 7334 (40).

Valls, J.F.M., C.E. Simpson, J.P. Moss, M.A.N. Gerin & G.P. Silva 7335 (40), 7337 (40), 7344 (40), 7345 (40), 7347 (40), 7349 (40), 7357 (40), 7359 (40), 7363 (40), 7377 (53), 7379 (53).

Valls, J.F.M., C.E. Simpson & G.P. Silva 7382 (53), 7384 (53).

Valls, J.F.M. & V.R. Rao 7529 (31), 7530 (42a), 7531 (20), 7533 (17), 7536 (17), 7537 (42a), 7539 (19).

Valls, J.F.M., V.R. Rao, M.A.N. Gerin & G.P. Silva 7540 (42a), 7541 (42a), 7542 (42a), 7543 (42a), 7545 (2), 7547 (2), 7549 (42a), 7554 (42a), 7555 (12), 7557 (9), 7560 (12), 7563 (7), 7565 (7), 7566 (7), 7568 (7), 7572 (7), 7574 (7), 7578 (9), 7580 (42a), 7581 (9), 7585 (9), 7586 (9), 7588 (7), 7590 (7), 7593 (7), 7594 (12), 7596 (7), 7598 (5), 7599 (5), 7600 (5), 7602 (5), 7603 (5), 7606 (13), 7607 (2), 7614 (13), 7617 (2), 7618 (5), 7619 (13), 7620 (13), 7621 (5), 7622 (9), 7623 (42a), 7624 (42a), 7627 (9), 7628 (8), 7630 (8), 7631 (33), 7632 (8), 7633 (33), 7634 (42a), 7635 (38), 7637 (33), 7638 (15a), 7639 (68), 7641 (42a), 7642 (42a), 7644 (8), 7647 (42a), 7648 (42a), 7656 (15a), 7658 (42a), 7659 (42a), 7669 (15a), 7671 (15a), 7672 (8), 7673 (42a), 7674 (15a), 7675 (15a), 7676 (8), 7677 (15a), 7678 (42a), 7679 (42a), 7680 (42a), 7681 (60), 7683 (15a), 7684 (15a), 7685 (15a), 7686 (42a), 7687 (8), 7688 (42a), 7694 (1), 7695 (41), 7698 (42a), 7700 (1), 7701 (41), 7704 (1), 7706 (41), 7707 (10), 7709 (10), 7710 (41), 7711 (10), 7712 (9), 7713 (42a), 7715 (11), 7716 (11), 7717 (5), 7718 (5), 7719 (42a), 7720 (42a).

Valls, J.F.M. & C.E. Simpson 7725 (19), 7727 (42a), 7728 (42a).

Valls, J.F.M., C.E. Simpson. H.T. Stalker, I. Godoy & W.L. Werneck 7732 (20), 7741 (20), 7742 (20), 7743 (20), 7745 (42a), 7760 (42a), 7761 (42a), 7762 (53), 7764 (53), 7784 (23), 7786 (23), 7793 (23), 7799 (22), 7805 (22), 7821 (22), 7850 (22), 7861 (23), 7862 (22), 7863 (22), 7868 (22), 7875 (22), 7880 (22), 7881 (55), 7883 (55), 7887 (19), 7894 (19), 7895 (19), 7897 (19).

Valls, J.F.M., R.F.A. Veiga, & G.P. Silva 8304 (19), 8308 (19), 8309 (22), 8321 (22), 8335 (22), 8343 (22), 8345 (27), 8352 (22), 8359 (22), 8373 (27), 8375 (22), 8377 (55), 8381 (55), 8383 (17), 8386 (27), 8390 (22), 8392 (27), 8402 (22), 8403 (27), 8405 (22), 8410 (29), 8413 (22), 8417 (27), 8418 (19), 8422 (27), 8423 (27), 8435 (27), 8437 (27), 8440 (29), 8442 (27), 8444 (27), 8451 (27), 8458

(27), 8461 (27), 8462 (29), 8466 (27), 8469 (29), 8471 (29), 8473 (22), 8475 (27), 8477 (27), 8481 (19), 8482 (19), 8486 (19), 8491 (27), 8494 (27), 8496 (22), 8501 (22), 8503 (29), 8505 (29), 8509 (29), 8511 (27), 8516 (27), 8519 (27), 8520 (27), 8522 (29).

Valls, J.F.M., A. Pott, Penteado, L. Jank & M. Araujo 8530 (8), 8555 (15a), 8568 (15a), 8644 (10), 8678 (38), 8711 (60), 8728 (1), 8729 (41).

Valls, J.F.M., A. Krapovickas, C.E. Simpson & G.P. Silva 8736 (36), 8740 (20), 8750 (39), 8753 (68), 8756 (36), 8758 (68), 8763 (68), 8764 (68), 8816 (24), 8818 (24), 8820 (24), 8887 (68), 8888 (68), 8889 (68), 8890 (36), 8891 (68), 8892 (68), 8893 (36), 8896 (64), 8900 (64), 8910 (36), 8916a (68), 8916b (39), 8918 (68), 8920 (39), 8922 (39), 8934 (62), 8935a (68), 8935b (39), 8937 (39), 8941 (39), 8943 (39), 8944 (39), 8945 (39), 8964 (68), 8965 (54), 8976 (20), 8977 (42a), 8978 (20), 8979 (68), 8980 (68), 8982 (20), 8986 (42a), 8988 (42a), 8989 (20), 8995 (20), 9000 (23), 9002 (42a), 9004 (23), 9010 (53), 9012 (53), 9013 (20), 9017 (53), 9019 (20).

Valls, J.F.M., A. Pott & L.B. Bianchetti 9056 (37), 9060 (37), 9061 (37), 9077 (37), 9094 (52), 9095 (52), 9129 (33), 9130 (37), 9140 (52), 9146 (52), 9147 (67), 9148 (67), 9153 (48), 9157 (48), 9162 (48), 9214 (68), 9230 (68), 9231 (68), 9235 (68), 9236 (68), 9237 (68), 9243 (68), 9257 (7), 9306 (53), 9318 (62), 9348 (20), 9349 (20), 9350 (36), 9354 (68), 9355 (68), 9357 (39), 9358 (39), 9359 (39), 9375 (68), 9394 (68), 9395 (68), 9397 (54), 9401 (39), 9402 (39), 9403 (39), 9455 (7), 9456 (9), 9468 (8), 9469 (8), 9470 (68), 9479 (68), 9481 (38), 9482 (38).

Valls, J.F.M. & W.L. Werneck 9858 (19).

Valls, J.F.M., C.E. Simpson & W.L. Werneck 9875 (5), 9878 (2), 9882 (5), 9887 (8), 9889 (33), 9894 (68), 9896 (68), 9902 (38), 9904 (33), 9906 (15a), 9907 (33), 9912 (68), 9913 (68), 9917 (33), 9918 (8), 9920 (42a), 9923 (52), 9932 (41), 9937 (5), 9941 (13), 9950 (21), 9952 (17), 9953 (58), 9955 (58).

Valls, J.F.M., S. Miotto & G.P. Silva 10229 (53).

Valls, J.F.M. & G.P. Silva 10309 (53), 10310 (53).

Valls, J.F.M., A. Pott, L. Jank & G.P. Silva 10322 (37), 10323 (37), 10324 (37), 10357 (38), 10384 (8), 10386 (12), 10387 (12), 10390 (12), 10392 (42a), 10396 (12), 10397 (8), 10404 (33), 10405 (68), 10407 (8), 10415 (42a), 10416 (9), 10420 (68), 10426 (12), 10427 (12), 10429 (7), 10430 (42a), 10433 (7), 10445 (39), 10447 (39), 10454 (68), 10467 (54), 10468 (36), 10469 (36), 10470 (62), 10471 (62), 10473 (20), 10476 (62), 10477 (62), 10506 (68), 10507 (68).

Valls, J.F.M., V.R. Rao, & G.P. Silva 10833 (27), 10837 (27), 10891 (27), 10892 (27), 10912 (29), 10913 (29), 10921 (27), 10922 (27), 10932 (27), 10933 (27), 10936 (29), 10939 (29), 10940 (29), 10945 (29), 10946 (29), 10947 (29), 10953 (29), 10960 (29), 10963 (29), 10968 (29), 10969 (27), 10972 (29), 10974 (29), 10980 (27), 10981 (29), 10988 (29), 10992 (29), 10993 (27), 11000 (27), 11001 (29), 11006 (29), 11008 (29), 11016 (29), 11020 (27), 11022 (27), 11027 (27), 11028 (19).

Valls, J.F.M., C.L. Quarin, M.S. França Dantas & G.P. Silva 11736 (42a), 11746 (5), 11758 (11), 11768 (5), 11778 (13), 11781 (11), 11886 (41), 11917 (41), 11922 (42a), 11923 (42a).

Valls, J.F.M. & A. Krapovickas 12080 (39), 12083 (62), 12084 (36), 12085 (23), 12086 (23).

Valls, J.F.M., C.N. Zanin, A.R. Miranda, J.C. Oliveira & W.L. Werneck 12322 (40).

Valls, J.F.M., M.L. Galgaro, D.M.S. Rocha & G.P. Silva 12488 (53), 12516 (16), 12523 (22), 12567 (22), 12568 (22), 12575 (53), 12618 (22).

Valls, J.F.M., M.L. Galgaro & G.P. Silva 12627 (22), 12646 (53).

Valls, J.F.M. 12658 (68).

Valls, J.F.M., Go, A.R. Miranda & J.C. Oliveira 12812 (61).

Valls, J.F.M., R.N. Pittman & G.P. Silva 12883 (21), 12893 (58), 12899 (19), 12900 (58), 12901 (27), 12915 (19), 12916 (17), 12927 (19), 12939 (21), 12940 (27), 12941 (19), 12952 (22), 12963 (19), 12967 (19), 12976 (19), 12978 (19), 13017 (22), 13021 (22), 13022 (27), 13023 (55), 13040 (19), 13044 (27).

Valls, J.F.M., L. Faraco de Freitas, E.A. Pizarro & G.P. Silva 13074 (30), 13075 (30), 13076 (30), 13080 (25), 13082 (28), 13097 (31), 13099 (31), 13102 (27), 13104 (27), 13105 (28), 13107 (27), 13109 (28), 13110 (31).

Valls, J.F.M. 13141 (31).

Valls, J.F.M., E.A. Pizarro, S.E.S. Valente & W.L. Werneck 13142 (19), 13150 (31), 13151 (31), 13153 (31), 13154 (31), 13155 (19), 13156 (19), 13157 (19), 13158 (19), 13159 (30), 13160 (31), 13161 (31), 13162 (31), 13165 (31), 13167 (31), 13172 (31), 13173 (31), 13175 (31), 13177 (19), 13182 (31), 13184 (19), 13185 (19), 13189 (28), 13193 (28), 13197 (30), 13198 (31), 13200 (31), 13202 (26), 13203 (26), 13211 (31).

Valls, J.F.M. 13250 (66).

Valls, J.F.M., C.E. Simpson, R.N. Pittman, D.E. Williams & G.P. Silva 13260 (53), 13262 (53), 13273 (42a).

Valls, J.F.M., C.E. Simpson, R.N. Pittman, E.A. Pizarro & R.C. dos Santos 13282 (31), 13286 (17),

13288 (31), 13290 (58), 13294 (31), 13296 (17), 13298 (31), 13305 (17), 13306 (27), 13307 (58), 13310 (31), 13312 (31), 13315 (31), 13317 (17).

Valls, J.F.M. & R.C. dos Santos 13322 (29).

Valls, J.F.M. & E.A. Pizarro 13326 (30).

Valls, J.F.M., E.A. Pizarro & W.L. Werneck 13328 (31), 13330 (31).

Valls, J.F.M. 13335 (31).

Valls, J.F.M. & Ek 13341 (31).

Valls, J.F.M. 13342 (31).

Valls, J.F.M., E.A. Pizarro, B. Maass, S.E.S. Valente & Db 13348 (58), 13350 (58), 13351 (31), 13352 (31), 13354 (31), 13355 (30), 13356 (31), 13357 (31), 13358 (31), 13363 (31), 13364 (31).

Valls, J.F.M., A.K. Singh & G.P. Silva 13371 (58), 13382 (29), 13383 (29), 13391 (30), 13392 (29), 13393 (29), 13395 (29), 13396 (29), 13397 (29), 13400 (29), 13403 (27), 13404 (28).

Vanni, R.O., M.S. Ferrucci, P. Cowan, R. Duré & A. Schinini 217 (42b), 327 (52), 342 (42a), 345 (52), 350 (15a), 359 (15a), 368 (15a), 399 (32), 400 (42a), 438 (15a).

Vanni, R.O. & S. Cáceres 643 (42a).

Vanni, R.O., L.I. Ferraro & M.S. Ferrucci 1152 (42a), 1273 (32), 1291 (32).

Vanni, R.O., S. Cáceres, G. López & A. Radovancich 1470 (63).

Veiga, R.F.A. 66 (53), 258 (53).

Venturi, S. 8354 (45).

Vieira, J.G.A., A. Amaya & L.A. Cáceres 288 (42a), 290 (42a), 291 (42a), 292 (42a).

Vorano, A.E. s/n (51).

Waechter, J.L. 1021 (40).

Warming, E. 2998 (30).

Weddell, H.A. 2922 (20).

Werneck, W.L. 1 (31), 2 (31), 3 (19), 17 (31), 34 (31), 39 (42a), 40 (42a), 41 (31), 47 (31).

Werneck, W.L. & P. Pinheiro 178 (26), 179 (27), 184 (28), 201 (26).

Williams, D.E. 691 (66), 697 (66), 699 (66), 809 (30), 860 (56), 861 (56), 866 (57), 867 (49).

Williams, D.E. & D. Claure 1117 (57), 1118 (49), 1120 (49).

Woolston, A.L. 117 (42b).

Zamboni, B. BAB 34763 (42a).

Zardini, E.M., N. Deginani, E. Ulibarri & F. Zuloaga 644 (63), 1032 (42a).

Zehntner 36-906 (25).

List of Parent Numbers used in Crosses

(Gregory, M.P. & W.C. Gregory, 1979)

Note: Percentage of pollen staining is based on the average of several counts of 500 pollen grains. Whenever possible, 10 counts were made for each parent number.

(*) For number 100 (sp. 29), the very low value of 59.6% was not assigned despite the fact that it was confirmed three times in the same individual with counts of 500 grains each.

Colletion no.		sp.	% pollen stain
1	9788 GKP	(11)	93.7-99.1
2	10582 GK	(8)	88.4-98.8
3	9646 GKP	(15b)	92.4-99.8
4	9837 GKP	(2)	98.8-100
5	10568 GK	(1)	89.6-99.8
6	PI 210554	(61)	80.0-96.2
7	10538 GKP	(30)	96.2-99.8
8	10038 GKP	(51)	90.2-99.4
9	PI 263394	(24)	
10	9570 GKP	(42a)	87.4-97.8
11	8012 K	(45)	85.4-98.0

Colletion no.		sp.	% pollen stain
12	10406 GKP	(18)	
13	9990 GKP	(37)	97.6-99.0
14	9764 GKP	(9)	
15	10127 GKP	(17)	98.8-99.8
16	9841 GKP	(12)	94.2-99.2
17	10585 GK	(15a)	89.2-100
18	10588 GK	(8)	79.8-99.8
19	9484 K	(50)	86.2-98.4
20	10598 GK	(32)	92.8-99.4
21	10034 GKP	(34)	96.4-99.8
22	9530-31 GKP	(63)	82.2-98.6

Colletion no.		sp.	% pollen stain	Colletion no.		sp.	% pollen stain
23	9830 GKP	(42a)	77.4-98.6	66	9591 GKP	(42a)	92.0-97.2
24	9629 GKP	(42a)	88.0-97.8	67	W.A.Archer	(42a)	67.4-89.8
25	10561 GK	(41)		68	577 HLKHe	(41)	54.0-77.0
26	10240 GKP	(19)	7.2-18.8	69	548 HLKHe	(5)	
27	10596 GK	(42a)	72.0-80.4	70	19455 KMoF	(47)	97.3-99.0
28	9667 GKP	(42a)	90.2-94.2	71	9645 GKP	(42a)	
29	9553 GKP	(42a)		72	9797 GKP	(42a)	94.2-98.8
30	10550 GK	(42a)		73	364 HLK	(40)	60.4-92.0
31	9634 GKP	(41)	98.4-99.4	74	30005 KG	(67)	99.2-99.8
32	PI 262130	(69a1)	97.6-98.0	75	362 HLK	(40)	92.8-100
33	9926 GKP	(62)		76	9901 GKP	(67)	98.8
34	10017 GKP	(65)	88.0-98.2	77	9882 GKP	(42a)	89.2-94.2
35	11462 KC	(15a)	91.2-99.0	78	9893 GKP	(42a)	97.4-99.0
36	11488 KC	(15a)	85.0-100	79	572 HLKHe	(14)	92.4-99.6
37	10602 GK	(67)	91.8-99.8	81	PI 262121	(69b2)	96.4
38	17 HLP	(40)		81	PI 262129	(69b2)	
39	7988 K	(51)	94.0-99.8	82	PI 261942	(69b1)	86.4-87.2
40	"Spantex"	(69b4)	90.4	82	PI 261991	(69b1)	
41	559 HLKHe	(8)	91.4-99.4	82	PI 262075	(69b1)	
42	410 HLK	(53)	96.2-99.8	83	PI 262092	(69a1)	
43	10160 GKP	(20)	95.6-96.0	84	9567 GKP	(42a)	91.2-93.2
44	10174 GKP	(20)	96.7-99.6	85	526 HLKHe	(3)	97.4-98.0
45	9923 GKP	(23)		86	16 HLP	(40)	95.2-97.6
47	9812 GKP	(13)	98.8-99.0	87	23 HLP	(40)	85.0-97.0
49	9935 GKP	(42a)	96.0-99.2	88	(NC 2)	(69a1)	95.8-97.0
50	9848 GKP	(6)	84.6-98.2	89	(NC 5)	(69a1)	97.6
51	9993 GKP	(37)		90	27 HLP	(40)	49.8-64.6
52	10002 GKP	(37)	90.2-100	91	354 HLKOj	(40)	75.6-97.0
53	10543 GK	(5)		92	(Pearl)	(69)	
54	10556 GK	(10)		93	(TMV2)	(69)	
56	10588 GK	(8)		94	569 HLKHe	(42a)	85.4-95.0
57	9966 GKP	(42a)	89.0-92.6	95	576 HLKHe	(41)	56.8-83.4
60	10559 GK	(41)	91.6-97.8	96	12787 GK	(31)	75.4-99.8
61	10565 GK	(41)	69.4-94.4	97	12881 GK	(25)	
63	565 HLKHe	(15b)	82.4-100	98	12922 GK	(25)	91.0-99.4
64	349 HLKOj	(42a)	71.2-94.2	99	12943 GK	(29)	95.2-97.6
65	551 HLKHe	(8)	92.8-97.2	100	12946 GK	(29)	*90.2-99.8

Abbreviations of Collectors' Names

A, A.C.Allem, CENARGEN, Brasilia, Brasil.
Ai, O.Arriola, INIA, Cuzco, Peru.
Aj, M.Araújo
Ar, W.A.Archer, USDA
B, D.J.Banks, USDA
Ba, J.R.Báez, EEA. Manfredi, Córdoba, Argentina.
Bi, L.B.Bianchetti, CENARGEN, Brasilia, Brasil.
Bm, B. Maass, CIAT, Cali, Colombia.
C, C.L.Cristóbal, IBONE, Corrientes, Argentina.
Co, L.Coradin, CENARGEN, Brasilia, Brasil.
Cr, M.Corro, Univ.J.M.Saracho, Tarija,Bolivia.
F, A.Fernández, IBONE, Corrientes, Argentina.
Fa, L.Faraco de Freitas, CENARGEN, Brasilia, Brasil.
Fd, M.Soter França Dantas, CPAC, EMBRAPA, Planaltina, DF, Brasil.
G, W.C.Gregory, North Carolina State University, Raleigh, NC, USA.
Ga, M.L.Galgaro, UNESP, Botucatú, SP, Brasil.
Gb, R.W.Gibbons, ICRISAT, India.
Gd, I.J. de Godoy, IAC, SP, Brasil.
Ge, M.A.N.Gerin, IAC, SP, Brasil.
Gr, A.Gripp, CENARGEN, Brasilia, Brasil.
H, R.O.Hammons, USDA
He, V.Hemsy, Facultad de Agronomía, Tucumán, Argentina.
Ht, W.Hartley, SCIRO, Australia.
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Jk, L.Janicki, PRODES, La Paz, Bolivia.
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M, J.P.Moss, ICRISAT, India.
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Oj, H.R.Ojeda, Fac. de Ciencias Agrarias, Corrientes, Argentina.
Ok, K.Okada, CIAT, Cali, Colombia.
Ov, J.C. Oliveira, EMBRAPA, CNPO, Bagé RS, Brasil.
P, J.R.Pietrarelli, EEA, Manfredi, Córdoba, Argentina.
Pe, M.I.Penteado
Pm, R.N.Pittman, USDA, Griffin, Georgia, U.S.A.
Po, A.Pott, EMBRAPA, Corumbá, MS, Brasil.
Pz, E.A.Pizarro, CIAT/CPAC-EMBRAPA, Planaltina, DF, Brasil.
Q, C.L.Quarin, IBONE, Corrientes, Argentina.
R, V.R.Rao, ICRISAT, India.
Ri, V.A.Rigoni, EEA Manfredi, Argentina.
Ro, D.M.S.Rocha, CENARGEN, Brasilia, Brasil.
Rs, Roseane C. dos Santos, CNPA, Campina Grande, Paraiba, Brasil.
S, C.E.Simpson, Texas A&M University, Stephenville, Texas, USA.
Sa, H.T. Stalker, North Carolina State University, Raleigh, NC, USA.
Sc, A.Schinini, IBONE, Corrientes, Argentina.
Sg, A.K. Singh, ICRISAT, India.
St, J.L.Stephens, USDA
Sv, G.P.Silva, EMBRAPA, Brasilia, Brasil.
V, J.F.M.Valls, CENARGEN, Brasilia, Brasil.
Va, S.E.S.Valente, UNESP, Botucatú, SP, Brasil.
Ve, R.F.de Arruda Veiga, IAC, SP, Brasil.
Vn, R.O.Vanni, IBONE, Corrientes, Argentina.
W, W.L.Werneck, CENARGEN, Brasilia, Brasil.
Wi, D.E. Williams, USDA.
Z, O.Zurita, Estación Exp. Agrícola, Saavedra, S.Cruz, Bolivia.
Zi, R.H.Zanini, INTA, Manfredi, Argentina.
Zn, C.N.Zanin, IBONE, Corrientes, Argentina.

Interspecific Crosses Conducted[10]

Crosses within each section

Sect. I. *TRIERECTOIDES*				
A. tuberosa **x**				
(4)				
A. guaranitica	4 x 5		5 x 4	
Sect. II. *ERECTOIDES*				
A. paraguariensis subsp. paraguariensis **x**				
(3,17,35,36)				
A. paraguariensis	3 x 35	24%	35 x 3	70.3%
A. paraguariensis	3 x 36	44.3%	36 x 3	42.1%
A. paraguariensis	35 x 36	52.3%	36 x 35	61.8%
A. stenophylla	3 x 79	16.8%		
A. Hermannii	3 x 16	4.3%	16 x 3	3.5%
A. Hermannii	36 x 16	0.9%		
A. gracilis	1 x 3	1.7%	3 x 1	0.3%
A. major	3 x 2	0.65%		
A. major	3 x 65	0.1%		
A. major	2 x 35	0.5%		
A. Benthamii	3 x 14	0.13%		
A. Benthamii	35 x 14			
A. Oteroi	3 x 53	0.2%	53 x 3	
A. Oteroi	35 x 53	1.8%		
A. Oteroi	36 x 53			
A. gracilis **x**				
(1)				
A. major	1 x 2	30%	2 x 1	
A. Hermannii	16 x 1	20.1%		
A. Martii	85 x 1	6.2%		
A. major **x**				
(2,18,41,56,65)				
A. major	2 x 41	11.7%		
A. Archeri	47 x 56	40.4%	56 x 47	17.6%
A. Hermannii **x**				
(16)				
A. Benthamii	16 x 14	19.1%		
A. Oteroi	16 x 53	17.6%		

[10]Interspecific crosses conducted by M.P. Gregory & W.C. Gregory (1979), with the parents' numbers (pp. 192-193) and the average value (%) of stained pollen in the hybrids obtained.

A. Hatschbachii **x**				
(50)				
A. Archeri	50 x 47			
A. Martii **x**				
(85)				
A. stenophylla	85 x 79	0.07%		
Sect. III. *EXTRANERVOSAE*				
A. villosulicarpa **x**				
(9)				
A. marginata	9 x 12			
A. Macedoi	9 x 15			
A. prostrata	9 x 26	0.1%		
A. lutescens	9 x 43	0.2%	43 x 9	0.3%
A. lutescens	9 x 44	0.2%		
Sect. IV. *TRISEMINATAE*				
A. triseminata **x**				
(97)				
A. triseminata	97 x 98	68.2%	98 x 97	50.7%
Sect. V. *HETERANTHAE*				
A. Dardani **x**				
(99)				
A. Dardani	99 x 100	20.6%	100 x 99	20.5%
Sect. VI. *CAULORRHIZAE*				
A. Pintoi **x**				
(96)				
A. repens	96 x 7	86.8%		
Sect. VII. *PROCUMBENTES*				
A. appressipila **x**				
(13,52)				
A. lignosa	13 x 20	30.9%	20 x 13	26.8%
A. lignosa			20 x 52	29.2%
A. Rigonii **x**				
(21)				
A. lignosa	20 x 21	54.4%	21 x 20	54.4%
A. appressipila	21 x 52	40.2%		
Sect. VIII. *RHIZOMATOSAE*				
A. glabrata **v.** ***glabrata*** **x**				
(10,23,24,27,77,84)				
A. glabrata v. *glabrata*	10 x 23	78.1%		
A. glabrata v. *glabrata*	10 x 27		27 x 10	
A. glabrata v. *glabrata*	10 x 84	12.9%		
A. glabrata v. *glabrata*	24 x 10	91.3%		
A. glabrata v. *glabrata*	23 x 77	45.2%		

A. glabrata v. *glabrata*	24 x 27	92.9%	27 x 24	
A. glabrata v. *glabrata*	24 x 77	71.3%		
A. glabrata v. *glabrata*	27 x 23	68.6%		
A. glabrata v. *glabrata*	27 x 77	84%	77 x 27	68.7%
A. pseudovillosa	60 x 10			
A. pseudovillosa	60 x 27			

Sect. IX. *ARACHIS*

Annuals x Annuals

A. duranensis **x**				
(8 & 39)				
A. duranensis	8 x 39	31.3%	39 x 8	36.7%
A. stenosperma	8 x 42	17.0%	42 x 8	18.1%
A. stenosperma	39 x 42	21.2%	42 x 39	15.5%
A. Batizocoi **x**				
(19)				
A. duranensis	8 x 19	0.9	19 x 8	0.01%
A. duranensis	19 x 39	4.9	39 x 19	17.4%
A. stenosperma	19 x 42	0.0	42 x 19	0.7%
A. ipaënsis	19 x 70	0.5%		
A. ipaënsis **x**				
(70)				
A. duranensis	70 x 8	1.5%		
A. duranensis	70 x 39	3.7%		

Annuals x Perennials

A. duranensis **x**				
(8 & 39)				
A. villosa	8 x 6	27.7%	6 x 8	
A. correntina	8 x 22	41.7%	22 x 8	
A. Cardenasii	8 x 34	52.2%	34 x 8	47.5%
A. Diogoi	8 x 37	27.1%	37 x 8	38.8%
A. villosa	39 x 6	22.3%	6 x 39	42.3%
A. correntina	39 x 22	54.3%	22 x 39	
A. Cardenasii	39 x 34	49.2%	34 x 39	71.2%
A. Diogoi	39 x 37	33.0%	37 x 39	
A. stenosperma **x**				
(42)				
A. villosa	42 x 6	22.5%	6 x 42	27.8%
A. correntina	42 x 22	37.6%	22 x 42	32.2%
A. Cardenasii	42 x 34	50.5%	34 x 42	
A. Diogoi	42 x 37	88.5%	37 x 42	36.6%
A. Batizocoi **x**				
(19)				
A. villosa	19 x 6	0.2%	6 x 19	2.9%
A. correntina	19 x 22	0.97%	22 x 19	
A. Cardenasii	19 x 34	0.07%	34 x 19	0.07
A. Diogoi	19 x 37	0.1%		

Annuals x Tetraploids

A. duranensis **x**				
(8 & 39)				
A. monticola	8 x 11			
A. hypogaea v. *hypogaea*	8 x 32	18.9%		
A. hypogaea v. *peruviana*	8 x 81	7.8%		
A. hypogaea v. *fastigiata*	8 x 82	---		
A. hypogaea v. *hypogaea*	8 x 89	3.1%		
A. hypogaea v. *hypogaea*	39 x 88	5.2%		
A. stenosperma **x**				
(42)				
A. monticola	42 x 11	3.3%	---	
A. hypogaea v. *fastigiata*	---		82 x 42	4.8%
A. Batizocoi **x**				
(19)				
A. hypogaea v. *fastigiata*	19 x 82	0.2%	82 x 19	3.5%
A. ipaënsis **x**				
(70)				
A. hypogaea v. *hypogaea*	70 x 32	---	---	

Perennials x Perennials

A. villosa **x**				
(6)				
A. correntina	6 x 22	73.1%	22 x 6	67.3%
A. Cardenasii	6 x 34	70.4%	34 x 6	68.4%
A. Diogoi	6 x 37	28.9%	37 x 6	---
A. correntina **x**				
(22)				
A. Diogoi	22 x 37	32.2%	37 x 22	35.8%
A. Cardenasii **x**				
(34)				
A. correntina	34 x 22	63.8%	---	
A. Diogoi	34 x 37	48.3%	37 x 34	44.8%

Perennials x Tetraploids

A. villosa **x**				
(6)				
A. monticola	6 x 11		11 x 6	45.7%
A. hypogaea v. *fastigiata*	6 x 82			
A. Cardenasii **x**				
(34)				
A. monticola			11 x 34	1.0%
A. hypogaea v. *hypogaea*	34 x 32	5.7%		
A. hypogaea v. *hypogaea*			83 x 34	28.3%
A. hypogaea v. *hypogaea*			88 x 34	
A. hypogaea v. *hypogaea*			89 x 34	9%
A. hypogaea v. *fastigiata*			81 x 34	2%

***A. Diogoi* x**				
(37)				
A. monticola			11 x 37	2.5%
A. hypogaea	37 x 82	7.5%		
A. hypogaea v. *hypogaea*	37 x 83	18.5%	83 x 37	30.0%
A. hypogaea v. *hypogaea*	88 x 37	3.8%		
A. hypogaea v. *hypogaea*	37 x 89	5.3%	89 x 37	3.6%
A. hypogaea v. *fastigiata*			81 x 37	6.6%$

Crosses between sections

Sect. I. *TRIERECTOIDES x II. ERECTOIDES*

***A. tuberosa* x**				
(4)				
A. gracilis	4 x 1	11.8%	1 x 4	18.7%
A. major	4 x 2		2 x 4	4%
***A. guaranitica* x**				
(5)				
A. gracilis	5 x 1	10.3%	1 x 5	3%
A. major	5 x 2	4.8%	2 x 5	2.6%
A. paraguariensis subsp. *paraguariensis*	5 x 3	1.1%	3 x 5	0.4%
A. paraguariensis subsp. *paraguariensis*	5 x 35		35 x 5	0.2%

Sect. I. *TRIERECTOIDES* x VII. *PROCUMBENTES*

***A. guaranitica* x**		
(5)		
A. appressipila	13 x 5	0.7%

Sect. II. *ERECTOIDES* x V. *HETERANTHAE*

***A. paraguariensis* subsp. *paraguariensis* x**		
(3,35)		
A. Dardani	3 x 99	0.6%
A. Dardani	35 x 99	2%

Sect. II. *ERECTOIDES* x VI. *CAULORRHIZAE*

***A. major* x**	
(3,18,41)	
A. repens	3 x 7
A. repens	18 x 7
A. Pintoi	96 x 41

A. paraguariensis* subsp. *paraguariensis x (17,36)				
A. repens	17 x 7	6 %		
A. Pintoi	36 x 96	3.5%		

Sect. II. *ERECTOIDES* x VII. *PROCUMBENTES*

A. paraguariensis* subsp. *paraguariensis x (3,17,35,36)				
A. appressipila	3 x 13		13 x 3	
A. appressipila	3 x 52	1.8%	52 x 3	4.5%
A. appressipila	35 x 13	1.3%		
A. appressipila	35 x 52	3.9%		
A. appressipila	36 x 13	1.3%		
A. Rigonii	21 x 3	1.7%		
A. Rigonii	21 x 17	4.9%		
A. Rigonii	35 x 21		21 x 35	1.2%
A. Rigonii	36 x 21	1%	21 x 36	1%
A. major x (18)				
A. lignosa	18 x 20	0.1%		
A. appressipila x (13,52)				
A. major	2 x 52	0.7%		
A. major	13 x 2	0.5%		
A. Benthamii	13 x 14			
A. Hermannii	13 x 16	4.2%	16 x 13	4.8%
A. Hermannii	16 x 52	1.9%		
A. Martii	13 x 85	0.4%		
A. Rigonii x (21)				
A. Hermannii	16 x 21	6.9%	21 x 16	6%
A. gracilis	21 x 1	12.2%		
A. major	21 x 2	0.6%		
A. major	21 x 18	0.3%		
A. major	21 x 41	1%		
A. Benthamii	21 x 14	2.6%		
A. Archeri	21 x 47	0.8%		
A. Oteroi	21 x 53			
A. Martii	21 x 85	0.3%		

Sect. II. *ERECTOIDES* x VIII. *RHIZOMATOSAE*

A. major x (2,18,41)				
A. glabrata v. *glabrata*	2 x 10			
A. glabrata v. *glabrata*	2 x 24			
A. glabrata v. *glabrata*	2 x 27			
A. glabrata v. *glabrata*	18 x 10			
A. glabrata v. *glabrata*	18 x 27			
A. glabrata v. *glabrata*	41 x 27			
A. glabrata v. *glabrata*	41 x 94	29.6%		

***A. paraguariensis* subsp. *paraguariensis* x**			
(3,17,35,36)			
A. glabrata v. *glabrata*	3 x 72		
A. glabrata v. *glabrata*	17 x 10		
A. glabrata v. *glabrata*	17 x 24		
A. glabrata v. *glabrata*	17 x 27		
A. glabrata v. *glabrata*	35 x 10		
A. glabrata v. *glabrata*	36 x 10		
A. glabrata v. *glabrata*	36 x 24		
A. glabrata v. *glabrata*	36 x 27		
A. glabrata v. *glabrata*	36 x 66		
A. glabrata v. *glabrata*	36 x 72		
A. pseudovillosa	36 x 60		
***A. Benthamii* x**			
(14)			
A. glabrata v. *glabrata*	14 x 10		
A. glabrata v. *glabrata*	14 x 24		
***A. Hermannii* x**			
(16)			
A. glabrata v. *glabrata*	16 x 10		
A. glabrata v. *glabrata*	16 x 24		
A. glabrata v. *glabrata*	16 x 27		
A. glabrata v. *glabrata*	16 x 94		
A. pseudovillosa	16 x 60	46.1%	60 x 16
Sect. II. *ERECTOIDES* x IX. *ARACHIS*			
***A. duranensis* x**			
(8,39)			
A. gracilis	8 x 1		
A. Hermannii	16 x 39	1.2%	
Sect. III. *EXTRANERVOSAE* x V. *HETERANTHAE*			
***A. Macedoi* x**			
(15)			
A. Dardani	100 x 15		
Sect. VI. *CAULORRHIZAE* x VII. *PROCUMBENTES*			
***A. Pintoi* x**			
(96)			
A. lignosa	96 x 20	0.2%	
A. Rigonii	96 x 21		
Sect. VII. *PROCUMBENTES* x VIII. *RHIZOMATOSAE*			
***A. appressipila* x**			
(13)			
A. glabrata v. glabrata	13 x 10	22.2%	
A. glabrata v. *glabrata*	13 x 27		

A. Rigonii **x**		
(21)		
A. glabrata v. *glabrata*	21 x 23	14.9%
A. glabrata v. *glabrata*	21 x 27	
A. pseudovillosa	21 x 25	
A. pseudovillosa	21 x 31	
Sect. IX. *ARACHIS* x VIII. *RHIZOMATOSAE*		
A. duranensis **x**		
(8,39)		
A. glabrata v. *glabrata*	8 x 10	
A. glabrata v. *glabrata*	8 x 23	
A. glabrata v. *glabrata*	8 x 24	
A. glabrata v. *glabrata*	8 x 27	
A. glabrata v. *glabrata*	8 x 28	
A. glabrata v. *glabrata*	8 x 29	
A. glabrata v. *glabrata*	8 x 64	
A. glabrata v. *glabrata*	8 x 84	
A. glabrata v. *glabrata*	39 x 27	
A. glabrata v. *glabrata*	39 x 84	
A. glabrata v. *glabrata*	39 x 95	
A. pseudovillosa	8 x 31	
A. Batizocoi **x**		
(19)		
A. glabrata v. *glabrata*	19 x 23	
A. glabrata v. *glabrata*	19 x 24	
A. glabrata v. *glabrata*	19 x 27	
A. glabrata v. *glabrata*	19 x 29	
A. glabrata v. *glabrata*	19 x 30	
A. glabrata v. *glabrata*	19 x 64	
A. glabrata v. *glabrata*	19 x 72	
A. glabrata v. *glabrata*	19 x 94	0.03%
A. pseudovillosa	19 x 31	
A. pseudovillosa	19 x 60	
A. stenosperma **x**		
(42)		
A. glabrata v. *glabrata*	42 x 10	

¼□

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[11]Page numbers for descriptions of valid names appear in bold.
[12]The authors' abbreviations are those recommended by Brummitt & Powell (1992).

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